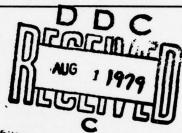




NOSC TR 426



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Technical Report 426

AVAILABILITY STUDY OF THE AN/WLR-1G AND AN/SLQ-32(V)2 ELECTRONIC SUPPORT MEASURE (ESM) SYSTEMS CDRL A001

J. Valenzuela W. Eichelberger Evaluation Research Corporation San Diego, Ca 92101 (N66001-78-R-0138)

Monitored by D. H. Marx, NOSC

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SECURITY CLASSIFICATION OF THIS PAGE (When Date Entered) **READ INSTRUCTIONS** REPORT DOCUMENTATION PAGE BEFORE COMPLETING FORM RECIPIENT'S CATALOG NUMBER 2. GOVT ACCESSION NO. NOSC ORT & PERIOD COVER October 1978 - February 1979 Availability Study of the AN/WLR-IG and AN/SLQ-32(V)2 Electronic Support Measure Systems 5. PERFORMING ORG. REPORT NUMBER CONTRACT OR GRANT NUMBER(*) AUTHOR(a) N66001-78-R-0318 Evaluation Research Corporation J. Valenzuela W. Eichelberger PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS PERFORMING ORGANIZATION NAME AND ADDRESS Naval Ocean Systems Center 62712N SS21 San Diego, Ca. 92152 12 DEPOST DATE 11. CONTROLLING OFFICE NAME AND ADDRESS 20 February 1979 14. MONITORING AGENCY NAME & ADDRESS(II different from Controlling Office) 15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING 16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited. 17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) 18. SUPPLEMENTARY NOTES 19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Availability **Electronic Support Measures** Electronic Warfare Maintainability Reliability 20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Meantime between failure and meantime to repair studies were conducted for the AN/WLR-IG and the AN/SLQ-32(V)2 systems. The AN/WLR-IG studies were based on data in the Navy 3M logistical reporting system. AN/SLQ-32(V)2 analyses were based on limited operational evaluation data. Equipment availability and supporting MTBF and MTTR data are given for different operating modes.

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EXECUTIVE SUMMARY

Objective

The objective of this study was to analyze the AN/WLR-1G and the AN/SLQ-32(V)2 ESM systems reliability and maintainability characteristics in order to determine their inherent and operational availability and their associated design and logistic support constraints. This report highlights the strengths and weaknesses in the availability of these two systems. From this study it is hoped to establish requirements from which to build the specifications of a third generation ESM system and to foster improvements where appropriate to existing hardware.

Methodology

Operational and support requirements of the AN/WLR-1G, ESM system were reviewed. The reliability and maintainability of the AN/WLR-1G was then evaluated using both 3-M field data and MIL-HDBK 217B Prediction Techniques. The resulting Mean-Time-Between-Failure (MTBF), Mean-Time-to-Repair (MTTR) and Mean-Down-Time (MDT) numbers were used to calculate inherent and operational availability for the system. The AN/SLQ-32(V)2 was evaluated in the same manner.

Findings

Tables A-1, A-2a and A-2b provide the Reliability, Maintainability and Availability (RMA) data for the AN/WLR-1G and the AN/SLQ-32(V)2. Table A-2a provides a summary of predictions developed for the suite 2 of the AN/SLQ-32(V). Table A-2b is a summary of data gathered for the ESM portion of the Prototype and equivalent to suite 2 of the production configuration.

TABLE A-1

RMA RESULTS FOR THE AN/WLR-1G

MTBF (MIL-HDBK 217B Prediction)	106 hours
MTTR (MIL-HDBK 472 Procedure 2 Prediction)	3.35 hours
MDT (3-M Field Data)	72 hours
Inherent Availability	0.97
Operational (Actual Field) Availability	0.58

Inherent availability $(\frac{\text{MTBF}}{\text{MTBF} + \text{MTTR}})$ provides a measure of the system design constraints. The operational availability $(\frac{\text{MTBF}}{\text{MTBF} + \text{MDT}})$ provides a measure of the available logistics support. The constituent elements of MDT with their respective percent distributions are discussed in section 3.4.1 and are shown below:

<u>Item</u>	Hours	Percent
Repair Time/yr.	171.0	4.7
Logistics Delay Time/yr.	3261.2	90.1
Administrative Time/yr.	51.0	1.4
PMS Time/yr.	137.8	3.8
Total Down Time/yr.	3621.0	100.0

TABLE A-2a

RMA RESULTS FOR THE AN/SLQ-32(V)2

MTBF (MIL-HDBK 217B Prediction)	259 hours
MTTR (MIL-HDBK 472 Procedure 2 Prediction)	1.045 hours
Inherent Availability	0.99
Operational (Projected Field) Availability	See Note 1

 $[\]underline{1}/$ This value is discussed and presented in section 4.3.3 in the report.

TABLE A-2b

AN/SLQ-32(V) PROTOTYPE TECHEVAL DATA SUMMARY

ESM Operat	ting Hours	1034 hours
ESM Total	Maintenance Actions	8
ESM Mainte	enance Actions considered major failures	2
ESM Mainte	enance Actions considered minor failures · · · ·	• • • 3 • • • • • • • • • • • • • • • •
ESM Mainte	enance Actions considered preventive maint.	3
ESM Total	Major Failure $\frac{2}{}$ corrective maintenance time	3.96 hours
ESM Total	Minor Failure $\frac{3}{2}$ corrective maintenance time	5.2 hours
ESM Total	Preventive maintenance time	.76 hours
*Observed H	ESM MTBF	517 hours
*Observed F	ESM Mean corrective maintenance time	1.98 hours
*Observed H	ESM inherent availability	0.996

Conclusions

Key failures which impact both MTBF and MTTR of the AN/WLR-1G are as follows:

- 1. One half of repair actions (22 out of 44) over a 30 month period were associated with the IP-480 display. These took 7.1 hours on an average to repair, or 156.2 hours (Table 3-3).
- 2. Converter CV-742 is the unit showing the longest repair time: The resultant MTTR was 16.4 hours. Three repair actions were involved causing a 49.2 hour experience (Table 3-3).
- 3. Tubes accounted for 50% of system failures; variable resistors (RV) accounted for 24% of system failures (68 of the 104 variable resistors are in the IP-480).

Further studies which included the AN/SLQ-32(V)2 system provided additional insight into the availability goals for future ESM systems. Inherent availability goals are

^{2/} Major Failure - ESM mission accomplishment prevented

^{3/} Minor Failure - ESM mission accomplishment degraded

^{*} Based on 2 major failures

tabulated below along with indications of the difficulty for attainment:

ESM RMA GOALS

MTBF (hours)	MTTR (hours)	<u>A</u>	LIKELIHOOD OF ACHIEVEMENT
• •• 250	1.0	0.996	Modestly Difficult
250	0.5	0.998	Difficult
500	1.0	0.998	Difficult
500	0.5	0.999	Very Difficult

Design efforts to obtain these goals must consider the following:

- 1. Use of self-test features.
- 2. Use of standard components based on a low failure rate technology.
- 3. Implementation of redundancy
 - a. Adoption of techniques (for example: antennas) wherein performance "gracefully" degrades with component failure.
 - b. Separation of performance functions into several modes of operation wherein failure of one mode would still permit mission success in some acceptable degraded capability.
- 4. Quality Assurance and Quality Control during the procurement and development stages.
- Mechanical design to facilitate access and to minimize environmental effects.

Recommendations

The following studies are proposed based upon conditions discovered during this availability study of the AN/WLR-1G and the AN/SLQ(V)2 ESM systems:

- Study of CASREPS to determine if supply line constraints are causing unnecessary down time.
- Study of the CV-3599 replacement for the CV-741 and CV-742 to determine its effect on AN/WLR-IG MTBF.
- Study of the feasilbility of replacing the IP-480 and Power Supplies (PP 2156D and PP 2157D).

- 4. Study of the AS-899 Antenna drive train mechanization to determine what may be causing coupling failures.
- 5. Study of the CV-1162A Tuner regulator to determine what may be causing abnormal high failure rate.

The studies are proposed in the order of priority. This order of studies is recommended as the most effective relative to design and development of ESM. However, it has been indicated that data may be currently available that would minimize the extent of studies 2 and 3.

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В	AN/WLR-1G Reliability Prediction Worksheets	*
С	AN/WLR-1G Maintainability Prediction Worksheets	*
D	Availability Math Models	*

1.0 INTRODUCTION

This report has been prepared specifically to analyze the AN/WLR-1G and the AN/SLQ-32(V)2 reliability and maintainability characteristics in order to determine their availability indicies along with the associated design and logistic support constraints. By highlighting strong points and weak points in the availability of these two systems it is hoped to establish the requirements from which to build the specifications of a third generation ESM and to foster improvements where appropriate to existing hardware.

2.0 SCOPE

The studies performed in this report were limited to suite 2 of the AN/SLQ-32(V)2 and band 9 operation for the AN/WLR-1G. Specific areas addressed were:

- 1) Support requirements (Maintenance requirements)
- 2) Operational Requirements
- 3) Electrical Design Constraints functional redundancy
- 4) Mechanical Design Constraints maintainability and degree of modularity
- 5) Fault isolation effectiveness
- 6) Equipment environmental exposure

The study was based on review of operating and support requirements specified in the applicable Technical Manuals,3-M data on the WLR-1G and technical data gathered on the USS Leahy for the SLQ-32(V) XN-1 prototype model.

3.0 STUDY OF THE AN/WLR-1G

For the purposes of this study only Band 9 operation of the AN/WLR-1G was considered. Both reliability and maintainability evaluations were made on Band 9 from which both inherent and operational availabilities were computed for its various operational modes.

3.1 AN/WLR-1G SYSTEM DESCRIPTION

The AN/WLR-1G receiving set is comprised of a number of units which contain RF tuners, frequency converters, RF switches, power supplies and a pulse analyzer. When coupled with the AS-899/SLR and other antennas, the AM-1017B Magnetic Control Amplifier, the C-3118 Control Indicator and the AN/WLA-3B Amplifier, a complete ESM receiver system is formed. This is the surveillance system currently being used in the fleet.

The AN/WLR-1G equipment is physically split into three locations when installed aboard ships. The tuners, power supplies and RF switches are, in most ships, installed in an ESM equipment room. The antennas are mast mounted, either forward or aft, depending on the ship's configuration. The frequency converters, pulse analyzers and various control units are located in the operators' area in the CIC. Figure 3-1 presents a pictorial representation of the system components.

3.1.1 OPERATIONAL REQUIREMENTS

Normal Operation of the AN/WLR-1G is through direct control of the equipment by the operator. A minimum of 2 people are required to stand watch on this equipment and four hours is the maximum time an operator would normally be required to stand watch before being relieved. For extended operational periods, 4 or more persons may be required to man the AN/WLR-1G for a given ESM surveillance function.

Initially, the operator sets the equipment for an acquisition function of operation and begins to look for an indication of a signal (or signals) on the display. Upon detecting a signal the operator sets the equipment for the analysis function and determines signal bearing and signal characteristics via the display.

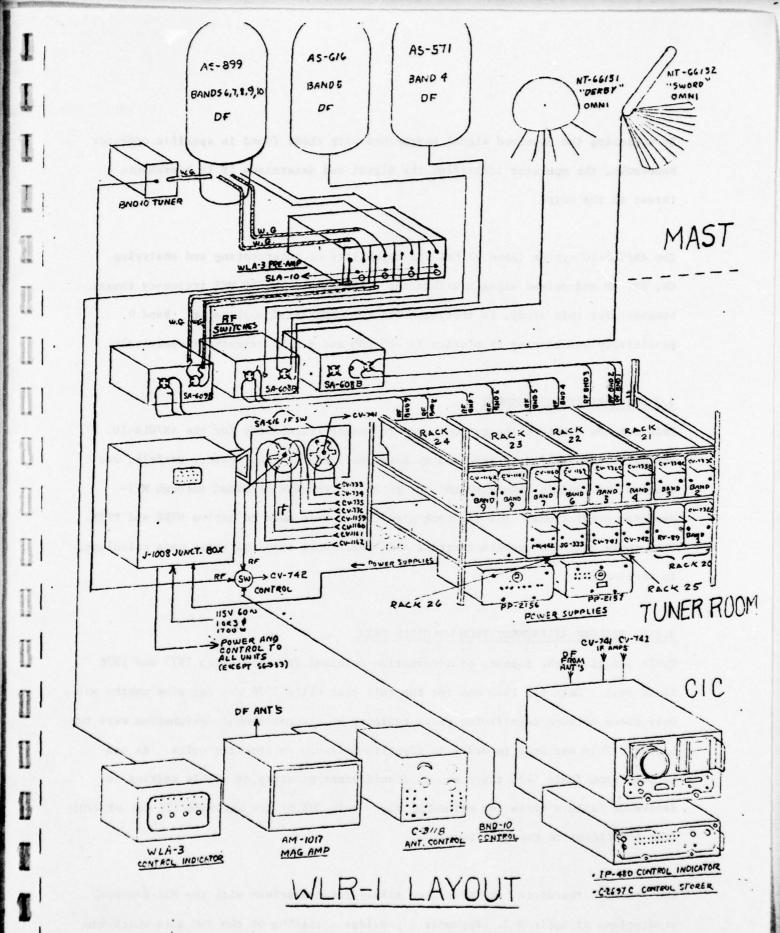


FIGURE 3-1 WLR-1G SYSTEM COMPONENTS

By comparing the observed signal parameters with those found in specific operator handbooks, the operator identifies the signal and determines if it represents a threat to the ship.

The AN/WLR-1G system (Band 9) has the capability of intercepting and analyzing CW, FM, AM and pulsed signals within the 7,300 MHZ to 10,750 MHZ frequency range; however, for this study, FM reception was not considered applicable. Band 9 sensitivity and bearing resolution is -80 DBM and $\pm 2.5^{\circ}$ azimuth, respectively.

3.2 RELIABILITY ASSESSMENT

This section examines the methods used to assess reliability for the AN/WLR-1G.

Basically, 3M field data supplied by Naval Ship Engineering Center, Norfolk, was studied and used to determine MDT and to verify results obtained through Mil-Handbook predictions. Mil-handbook predictions were used to derive MTBF and MTTR.

From these combined results inherent and operational availabilities were calculated in section 3.4.

3.2.1 FAILURE ASSESSMENT FROM 3-M FIELD DATA

Table 3-1 gives the summary of information obtained from analyzing 1975 and 1976 field data. Data for 1975 was for the full year while 1976 was for nine months only. Only those actions identifying parts replaced by circuit symbol designation were tabulated. This was done in order to identify failures to specific units. As can be seen from Table 3-1, there was an insufficient quantity of usable entries to determine failure rates for all units since only 20% of the listings (98 out of 470) were identified to the unit level.

The results, therefore, are presented mainly for comparison with the Mil-Handbook predictions of Table 3-2. Appendix A provides a listing of the 3-M data which was used.

TABLE 3-1

3-M FAILURE DATA SUMMARY - AN/WLR-1G

<u>UNIT</u>	DESCRIPTION	1975 FAILURES	1976 FAILURES	TOTAL FAILURES	PERCENT OF TOTAL FAILURES
* CV-732D	Band 1 Tuner	na loes a stoc	4	5	5.10
* CV-733D	Band 2 Tuner			2	2.04
* CV-734D	Band 3 Tuner	4	1	5	5.10
* CV-735D	Band 4 Tuner	2	0	2	2.04
* CV-736D	Band 5 Tuner	1	1	2	2.04
*CV-1159A	Band 6 Tuner	4	0	4	4.08
*CV-1160A	Band 7 Tuner	3	3	6	6.12
*CV-1161A	Band 8 Tuner	0	2	2	2.04
CV-1162A	Band 9 Tuner	1	5	6	6.12
CV-741D	Freq. converter	6	3	9	9.18
CV-742D	Freq. converter	5	1	6	6.12
IP-480	Pulse Analyzer	13	11	24	24.49
C-2697G	Control Storer	2	4	6	6.12
RF-89D	Freq. Discriminator		No Data		
PP-2156D	Power Supply	0	3	3	3.06
PP-2157D	Power Supply	6	2	8	8.16
J-1008C	Interconnect Box	1	1	2	2.04
SA-608C	Antenna Switch		No Data		
SG-333D	Pulse Test Equip.	0	3	3	3.06
SA-609C	Antenna Switch		No Data		
SA-616B	R.F. Switch	2	0	2	2.04
SA-608C	Antenna Switch .	_0	_2	_2	2.04
		50	48	98	100%

^{*}Results were not included in band 9 study

3.2.2 FAILURE ASSESSMENT BY MIL HANDBOOK PREDICTION

A reliability prediction was performed according to the procedures of MIL-HDBK-217B. The generic method of Section 3 in 217B was used on the AN/WLR-IG to obtain a preliminary estimate for this study. Mechanical part failure rates were assigned from data found in the RAC document "Nonelectronic Parts Reliability Data" and the "Mechanical Design and Systems Handbook".* Appendix B lists the generic failure data for all electronic and dynamic mechanical parts by units for the AN/WLR-IG and for peripheral equipment. Table 3-2 shows a summary of the total failure rate and MTBF by unit and peripheral equipment designation. These data were used in the availability indices derived in section 3.4.

3.2.3 RELIABILITY BLOCK DIAGRAMS WITH FAILURE ASSESSMENTS

Reliability block diagrams were developed for the three functional modes (DF, acquisition and analysis for band 9 operation) from the functional block diagram in figure 3-2. The reliability block diagrams indicate what is contained in each block and whether equipment operation is in a series or parallel (redundant) function. Figure 3-6 shows the overall combined operation reliability block diagram. Figures 3-3, 3-4 and 3-5 provide the apportioned failure rate reliability block diagrams for the DF mode, acquisition mode and analysis mode, respectively.

Once failure rates are assigned to the blocks shown in the reliability block diagram, the overall mode failure rate and hence, MTBF can be found for a particular mode, by the equation:

^{*} See references 5, 6 and 7

MTBF_{sys} =
$$\int_{0}^{\infty} R(t)dt = \int_{0}^{\infty} R_{\Sigma}(t)dt \cdot R_{5,6}(t)dt$$
 [3-1]

$$-\sum_{i=1}^{n} (\lambda_{i})t$$
where: $R_{\Sigma}(t) = e^{-\frac{1}{2}} = e^{-\frac{1}{2}}$ for $i = 1, 2, 3, 4, 7 - 14$

$$R_{5,6}(t) = e^{-\frac{1}{2}} + e^{-\frac{1}{2}} = e^{-\frac{1}{2}}$$

But, for the series blocks,

II

$$\int_{0}^{\infty} R_{\Sigma}(t) dt = \int_{0}^{\infty} e^{-\lambda_{\Sigma} t} dt = MTBF_{\Sigma} = \frac{1}{\lambda_{\Sigma}}$$
[3-2]

and, the redundant blocks,

$$\int_{0}^{\infty} R_{5,6}(t) dt = \int_{0}^{\infty} [e^{-\lambda_5 t} + e^{-\lambda_6 t} - e^{-(\lambda_5 + \lambda_6) t}] dt$$
 [3-3]

MTBF_{5,6} =
$$\frac{1}{\lambda_5} + \frac{1}{\lambda_6} - \frac{1}{\lambda_{5+\lambda_6}}$$
 [3-4]

Then substituting,

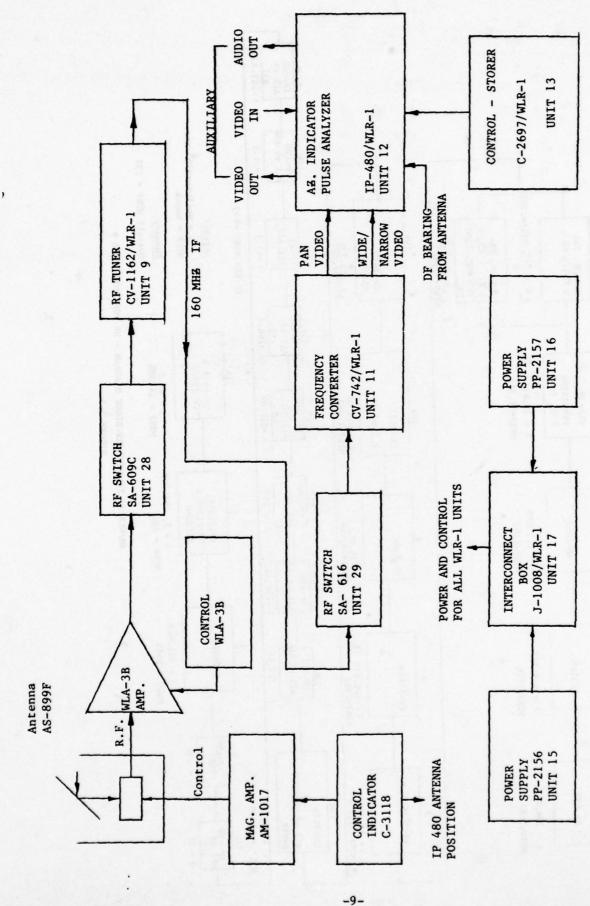
$$MTBF_{sys} = (\frac{1}{\lambda_{\Sigma}}) (\frac{1}{\lambda_{5}} + \frac{1}{\lambda_{6}} + \frac{1}{\lambda_{5} + \lambda_{6}})$$
 [3-5]

Shown below are the resultant MTBF's for the different modes of operation

MODE	MTBF (HOURS)
Acquisition	136
Analysis	118
DF	133
Combined	106

TABLE 3-2
AN/WLR-1G SYSTEM
RELIABILITY PREDICTION SUMMARY

UNIT	DESCRIPTION	F/10 ⁶ Hrs.	MTBF (Hrs.)	UNIT	DESCRIPTION	F/10 ⁶ Hrs.	MTBF (Hrs.)
CV-732D	Band 1 Tuner	315.544	3,169	SA-616B	R.F. Switch	7.200	138,889
CV-73D	Band 2 Tuner	312.395	3,210	SA-608C	Antenna Switch	23.730	42,141
CV-734D	Band 3 Tuner	314.895	3,176	ı	Rack 20	26.640	37,537
CV-735D	Band 4 Tuner	131.429	3,191	ŀ	Rack 21	22.240	44,964
CV-736D	Band 5 Tuner	708.209	1,412	1	Rack 22	24,880	40,193
CV-1159A	Band 6 Tuner	366.540	2,728	1	Rack 23	24.372	41,031
CV-1160A	Band 7 Tuner	370.540	2,699	1	Rack 24	25.252	39,601
CV-1161A	Band 8 Tuner	346.133	2,889	ŀ	Rack 25	44.276	22,586
CV-1162A	Band 9 Tuner	346.933	2,882	AS-899F	Antenna	704.27	1,420
CV-741D	Freq. converter	988.927	1,011	AM-1017B	Mag. Amp.	113.695	8,795
CV-742D	Freq. converter	1,112,149	899	C-3118	Ant. Control	449.149	2,226
IP-480	Pulse Analyzer	3,490.58	286	AN/WLA-3B	Amplifier	454.950	2,198
C-2697G	Control Storer	921.968	1,085				
RF-89D	Freq. Discriminator	993.823	1,006				
PP-2156D	Power Supply	794.339	1,259				
PP-2157D	Power Supply	1,343.355	744				
J-1008C	Interconnect Box	54.054	18,500				
SA-608C	Antenna Switch	22.230	44,984				
SA-609C	Antenna Switch	19.284	51,856				



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ANALR-1G FUNCTIONAL BLOCK DIAGRAM - BAND 9 TUNING

FIGURE 3-2

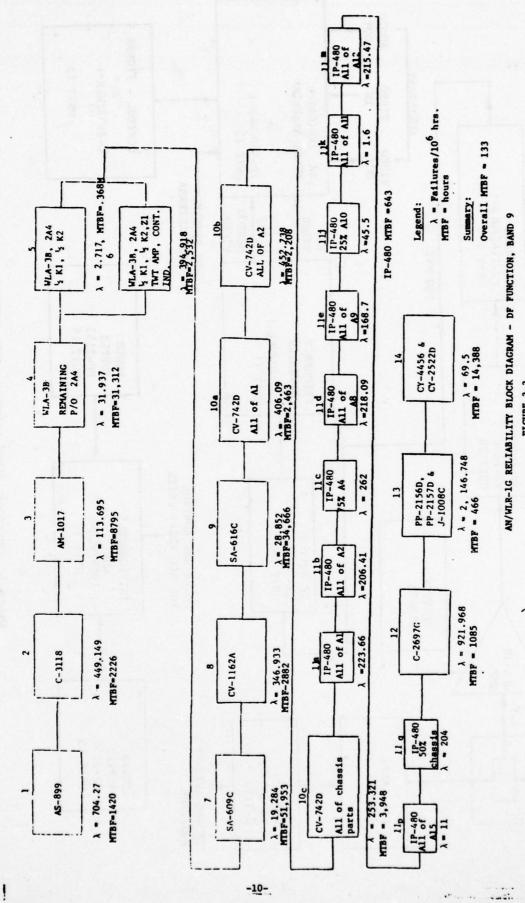
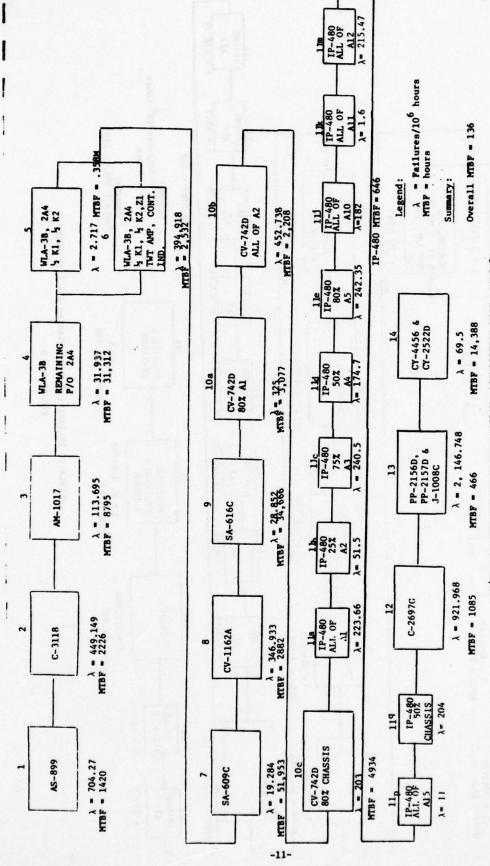


FIGURE 3-3

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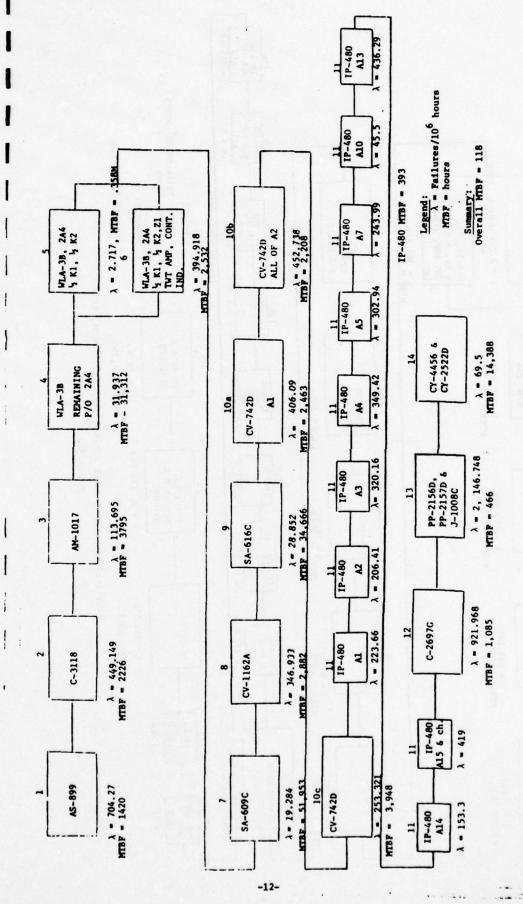
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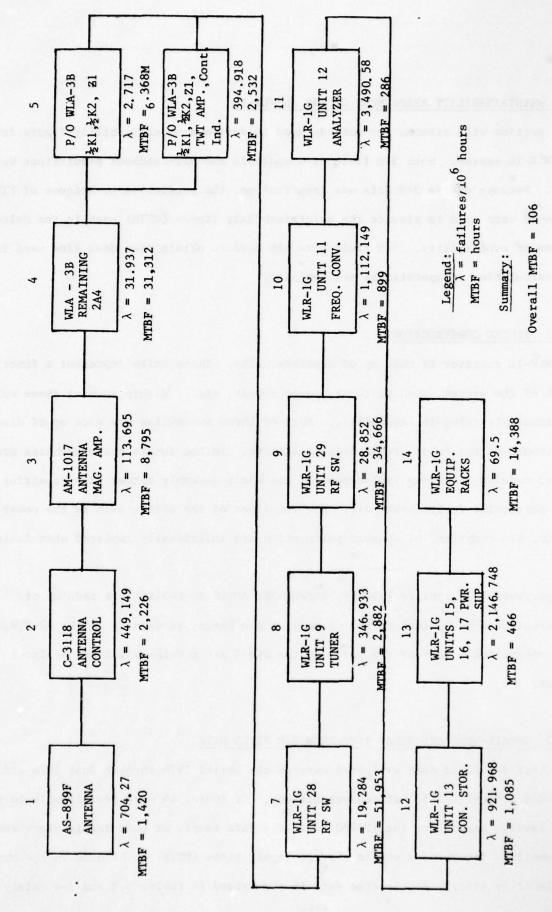
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AN/WLR-IG RELIABILITY BLOCK DIAGRAM- ACQUISITION MODE, BAND 9 FIGURE 3 - 4



AN/ WLR-1G RELIABILITY BLOCK DIAGRAM ANALYSIS MODE FIGURE 3 - 5



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AN/WLR-1G RELIABILITY BLOCK DIAGRAM - BAND 9, COMBINED MODES

FIGURE 3 - 6

3.3 MAINTAINABILITY ASSESSMENT OF THE AN/WLR-1G

This section will examine the methods used to derive a maintainability figure for the WLR-1G system. Both 3-M field data analysis and Mil-Handbook predictions were used. Because of the 3-M data was insufficient, the prediction techniques of MIL-HDBK-472 were used to provide the maintainability figure (MTTR) used in the calculation of availability. 3-M field data was used to obtain mean down time used in the calculation of operational availability.

3.3.1 SYSTEM CONSTRUCTION

The WLR-IG receiver is made up of separate units. These units represent a functional block of the system, such as tuner, power supply, etc. Within some of these units are removable (plug-in) assemblies. Most of these assemblies are made up of discrete electronic parts; tubes, resistors, capacitors. In the tuners the assemblies are sealed modules requiring replacement of the whole assembly rather than repairing it by a particular replacement part. The remainder of the units, such as the power supply, are comprised of chassis parts which are individually replaced when faulty.

The peripheral equipments (AS-899, AN/WLA-3B, AM-1017, C-3118) are made up of electronic and mechanical parts. Some of these parts, especially in the AS-899, form assemblies. Most of the parts in the WLA-3 are modules which are replaced intact.

3.3.2 REPAIR-TIME AND DELAY TIME FROM 3-M FIELD DATA

The first 3-M field data evaluated covered the period 1974 through June 1976 and included a total of 352 maintenance actions. Of these, 44 were identifiable to the unit level. Except for the IP-480 unit, the data sample of unit repair-times was too small to determine a usable average repair times (MTTR) to be used in the band 9 availability study. Repair-time data is summarized in tables 3-3 and 3-4 mainly for

TABLE 3-3

AN/WLR-1G UNIT LEVEL REPAIR TIME 3-M DATA 1974 THROUGH JUNE 1976

UNIT NAME	NUMBER OF REPAIR ACTIONS	AVERAGE REPAIR TIME* (Man-Hrs) (No. Repair Actions x 1.5	
PRESIDENCE COLL	20 A 1 68 9 6 9		
RF Tuner, CV1162	5	5.3	
RF Switch, SA-609C	1	2.7	
RF Switch, SA-b16C	1	13.3	
Converter, CV-742	3	16.4	
Azimuth Ind., IP 480	22	7.1	
Control Storer	4	5.5	
Power Supply, PP2156	3	10.2	
Power Supply, PP2157	4	13.5	
Interconnect, J-1008	1	2	

^{*}The Naval Ship Engineering Center, Norfolk determined that on the average, 1.5 men are used for each repair task. Therefore, man-hours are divided by 1.5 to determine repair time.

TABLE 3-4

IP 480 ASSEMBLY LEVEL REPAIR TIMES 3-M DATA 1974 THROUGH JUNE 1976

	Assembly Name	Number of Repair Actions	Avg. Repair Time* Man-Hrs No. Actions x 1.5
Al	Video AMP	4	2.3
A2	Panoramic AMP	1	1.3
A3	0-5 M Sec Sweep	1	1.3
A4	Pulse Stretcher	1	40
A5	5-500 Msec Sweep	none listed	one to the
A6	Not Used	none listed	-
A7	.5-50k M Sec Sweep	none listed	#00:013 1573000
A8	Horiz-Vert AMP	none listed	STATE OF THE SECOND
A9	DF PRE-AMP	none listed	CRESCH THE LAND
A10	Scan Video	none listed	-
A11	DF/Scan Selector	none listed	-
A12	Scan Deflection	3	2
A13	Freq. Ind.	6	10.8
A14	Ind. Servo AMP	none listed	-
A15	Equipment Cabinet	1	20
	Chassis	4	2.6
	Not Identificable Total	1 22	4.0

^{*}The Naval Ship Engineering Center has determined that on the average, 1.5 men are used for each repair task.

study and comparison with Mil-Handbook predictions in section 3.3.3. Appendix C contains the 3-M Field Data analysis sheets.

A second set of 3-M field data covering the period January through June 1978 was also evaluated. It included the 185 maintenance actions plotted in figure 3-7. The plot shows an exponential distribution of repair times. An exponential distribution of repair-time is typically found for equipments which have relatively low repair-times i.e. most repairs are accomplished within a short time. For the AN/WLR-1G receiver, a low repair-time would be expected considering that plug-in tubes are the most frequent repair time. (These results correlate with the results obtained in the next section from Mil-Handbook predictions.)

Examination of the field data showed that the AN/WLR-1G receiver inherently requires a high number of relatively short repairs. In addition, the IP-480, which requires the most frequent repairs, was usually repaired within the .6 to 3 hour time span. The less frequent repair-times had long durations indicating that repair-times reported may include administrative or logistics delay time. (Sample size for the AS-899 and AN/WLA-3B was too small for individual analysis)

Delay time was tabulated from the above sets of 3-M field data and shown in Table 3-5.

TABLE 3 - 5
ESTIMATED DELAY TIMES FOR AN/WLR-1G

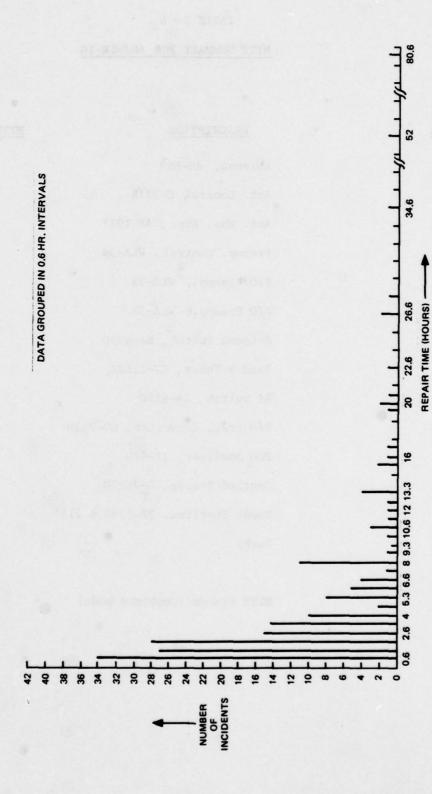
EQUIPMENT	ESTIMATED DELAY TIME (hcurs)	
WLR-1G Receiver	49	
899 Antenna	79	
WLA-3B Amplifier	89	
C-3118 Control	79	
AM 1017B Mag Amp	95	

These data were used to obtain mean down time for the operational availability calculations in Tables 3-7 through 3-10 by adding the respective equipment delay time to the associated MTTR (MDT = MTTR + Delay Time).

3.3.3 REPAIR-TIME EVALUATION BY MIL-HANDBOOK PREDICTION

Since repair-times could not be adequately determined from the 3-M field data, a maintainability prediction using procedure II of MIL-HDBK-472 was performed to assess an MTTR figure (see Table 3-6). Detailed time estimates and procedures are summarized in Appendix C.

Examination of Table 3-6 shows relatively long repair times associated with the antenna, the antenna control and the Preamp. Both the antenna and the WLA-3B Preamp are mast mounted and, therefore, difficult to access for maintenance.



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WLR-1G REPAIR INCIDENTS VS. REPAIR TIME (LINEAR SCALE)

FIGURE 3-7

TABLE 3 - 6

MTTR SUMMARY FOR AN/WLR-1G

BLOCK	DESCRIPTION	MTTR (HRS.)
1	Antenna, AS-899	6.0
2	Ant. Control, C-3118	5.1
3	Ant. Mag. Amp., AM-1017	5.1
4	Preamp. Control, WLA-3B	5.0
5	P/O Preamp., WLA-3B	5.0
6	P/O Preamp., WLA-3B	5.0
7	Antenna Switch, SA-609C	2.2
8	Band 9 Tuner, CV-1162A	2.35
9	RF Switch, SA-616C	2.48
10	P/O Freq. Converter, CV-742D	4.79
11	P/O Analyzer, IP-480	3.16
12	Control Storer, C-2697G	3.2
13	Power Supplies, PP-2156 & 2157	2.3
14	Racks	2.3
	MTTR System (Combined mode)	= 3.35 hours

The Control Indicator C-3118 has micro switches, synchros and resolver which have long interchange and alignment times. These components contribute heavily to the C-3118 overall high repair time - in the order of 1.5 to 2 hours of the 5.1 hour MTTR.

The Mag Amp AM 1017 has a high repair-time primarily because of difficulty in isolating faults and performing alignment. Coordination effort is required to ensure proper antenna rotation. In addition, by nature the magnetic amplifier, circuits are difficult to troubleshoot because proper understanding of its operation is difficult for most technicians. Some of its components are also difficult to access because of equipment construction.

The CV-742D Converter has a high repair-time because of lengthy alignment procedures.

Alignment along contributes about 3 hours of the 4.79 MTTR.

3.4 AVAILABILITY INDICES FOR THE AN/WLR-1G

Both Inherent and Operational Availability indices were determined for the AN/WLR-1 The results are presented in tables 3-7 through 3-10 for the several operational modes of the system. Inherent availability is defined as the probability that at any point in time the system will perform the specified function(s) for a successful mission. All support requirements are fully available. Redundancy is considered applicable and delay times are not existent. Operational Availability is defined as the probability that at any point in time the system is fully operational to perform in the particular mode of interest. Redundancy, therefore, would not be considered and all delay times are considered as part of total down time. The Inherent and Operational Availability math models used in these calculations are given in Appendix D.

TABLE 3 - 7
AN/WLR-1G DF MODE AVAILABILITY

REL	DESCRIPTION	(F/10 ⁶ HRS.)	REPAIR TIME (HRS.)	DOWNTIME (HRS.)
1	AS-899 ANTENNA	704.27	6.0	85.0
2	C-3118 ANT. CONTROL	449.149	5.1	84.1
3	AM-1017 ANT. MAG. AMP.	113.695	5.1	100.1
4	WLA-3B PRE AMP. CONT.	31.937	5.7	94.7
2	WLA-3B RELAYS	2.717*	5.0	0.46
9	WLA-3B TWT	394.918*	5.0	94.0
7	SA-609C ANT. SW.	19.284	2.2	51.2
8	CV-1162A TUNER	346.933	2.35	51.35
6	SA-616C RF SW.	28.852	2.48	51.48
10	CV-742D FREQ. CONV.	1112.149	4.79	53.79
=======================================	IP-480 ANALYZER	1554.43	3.16	52.16
12	C-2697G CONT. STORER	921.968	3.2	52.2
13	PWR. SUPPLIES & J-BOX	2146.748	2.3	51.3
14	RACKS	69.5	2.3	51.3

			TIME PERIOD		
PARAMETER	7 DAYS	30 DAYS	90 DAYS	180 DAYS	365 DAYS
INHERENT AVAILABILITY	0.97390604	0.97390361	0.97389930	0.97389607	0.97389407
OPERATIONAL AVAILABILITY	1	1	-	1	0.63970306

*Redundant Path

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TABLE 3 - 8

North North Name of Street, Na

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AN/WLR-1G ACQUISITION MODE AVAILABILITY

REL BLOCK	DESCRIPTION	(F/10 ⁶ HRS.)	REPAIR TIME (HRS.)	DOWNTIME (HRS.)
1	AS-899 ANTENNA	704.27	6.0	85.0
2	C-3118 ANT. CONTROL	449.149	5.1	84.1
3	AM-1017 ANT. MAG. AMP.	113.695	5.1	100.1
4	WLA-3B PRE AMP. CONT.	31.937	5.7	64.7
S	WLA-3B RELAYS	2.717*	5.0	0.46
9	WLA-3B TWT	394.918*	5.0	0.46
7	SA-609C ANT. SW.	19.284	2.2	51.2
80	CV-1162A TUNER	346.933	2.35	51.35
6	SA-616C RF SW.	28.852	2.48	51.48
10	CV-742D FREQ. CONV.	980.738	4.79	53.79
=	IP-480 ANALYZER	1546.0	3.16	52.16
12	C-2697G CONT. STORER	921.968	3.2	52.2
13	PWR. SUPPLIES & J-BOX	2146.748	2.3	51.3
14	RACKS	69.5	2.3	51.3

THE RESERVE OF THE PERSON OF T			TIME PERIOD		
PARAMETER	7 DAYS	30 DAYS	90 DAYS	180 DAYS	365 DAYS
INHERENT AVAILABILITY	0.97454204	0.9745396	0.97453530	0.97453206	0.97453006
OPERATIONAL AVAILABILITY	-			1	0.64426031

*Redundant Path

TABLE 3 - 9

AN/WLR-1G ANALYSIS MODE AVAILABILITY

S.)	85.0	84.1	100.1	7.76	0.46	0.46	51.2	51.35	51.48	53.79	52.16	52.2	51.3	51.3
DOWNTIME (HRS.)	85	84	10	76	76	76	51	51	51	53	52	52	51	51
REPAIR TIME (HRS.)	0.9	5.1	5.1	5.7	5.0	5.0	2.2	2.35	2.48	4.79	3.16	3.2	2.3	2.3
(F/10 ⁶ HRS.)	704.27	449.149	113.695	31.937	2.717*	394.918*	19.284	346.933	28.852	1112.149	2546.67	921.968	2146.748	69.5
DESCRIPTION	AS-899 ANTENNA	C-3118 ANT. CONTROL	AM-1017 ANT. MAG. AMP.	WLA-3B PRE AMP. CONT.	WLA-3B RELAYS	WLA-3B TWT	SA-609C ANT. SW.	CV-1162A TUNER	SA-616C RF SW.	CV-742D FREQ. CONV.	IP-480 ANALYZER	C-2697G CONT. STORER	PWR. SUPPLIES & J-BOX	RACKS
REL BLOCK	1	2	3	4	S	9	7	80	6	10	п	12	13	14

			TIME PERIOD		
PARAMETER	7 DAYS	30 DAYS	90 DAYS	180 DAYS	365 DAYS
INHERENT AVAILABILITY	0.97087675	0.970874334	0.97087004	0.97086682	0.97086482
OPERATIONAL AVAILABILITY	ı	1	1	1	0.61047726

*Redundant Path

TABLE 3 - 10
AN/WLR-1G COMBINED MODE AVAILABILITY

do

REL BLOCK	DESCRIPTION	(F/10 ⁶ HRS.)	REPAIR TIME (HRS.)	DOWNTIME (HRS.)
1	AS-899 ANTENNA	704.27	6.0	85.0
7	C-3118 ANT. CONTROL	449.149	5.1	84.1
3	AM-1017 ANT. MAG. AMP.	113.695	5.1	100.1
4	WLA-3B PRE AMP. CONT.	31.937	5.7	64.7
2	WLA-3B RELAYS	2.717*	5.0	0.46
9	WLA-3B TWT	394.918*	5.0	0.46
7	SA-609C ANT. SW.	19.284	2.2	51.2
8	CV-1162A TUNER	346.933	2.35	51.35
6	SA-616C RF SW.	28.852	2.48	51.48
10	CV-742D FREQ. CONV.	1112.149	4.79	53.79
11	IP-480 ANALYZER	3490.58	3.16	52.16
12	C-2697G CONT. STORER	921.968	3.2	52.2
13	PWR. SUPPLIES & J-BOX	2146.748	2.3	51.3
14	RACKS	69.5	2.3	51.3

			TIME PERIOD		223
PARAMETER	7 DAYS	30 DAYS	90 DAYS	180 DAYS	365 DAYS
INHERENT AVAILABILITY	0.96801246	0.96801005	0.96800576	0.96800255	0.96800057
OPERATIONAL AVAILABILITY		-			0.58505027

*Redundant Path

3.4.1 DISCUSSION OF AN/WLR-1G RESULTS

MDT = 72 hours.

As seen from the Tables, the inherent availability remains nearly constant over the selected time periods. The slight change that occurs in the numerical value of availability is due to the slightly increasing probability of failure of the redundant path as the time period increases. The small change in availability indicates that the redundant path failures have a small effect on overall inherent availability.

The operational availability figures shown in the tables are probably representative of day to day activity over the 1 year period — that is, the time expended in keeping the equipment at optimum conditions. To assess the impact of down time on operational availability, the contribution of the several elements of down time may be evaluated. Administrative time may be mathematically estimated from known distribution of repair time*. Such an estimate for this system would range from 0.5 to 1 hour. PMS time is found to be 137.8 hours from the PMS Table in Appendix C by adding the appropriate maintenance times over a 1 year period. The MTBF for the system is found to be 101.7 hours by summing all failure rates shown in Table 3-10. The MDT is found to be 72 hours by finding the average of the failure-rate-weighted Delay Times in Table 3-10. The resultant one year down time is:

Number of failures per year = (24 hours)(365)/(MTBF + MDT) = 51Down Time yr. = Repair Time yr. + Logistics Delay yr. + (1.0)(51) + 137.8From the above equation, Logistics Delay yr. is derived to be 3261.2 hours. The constituent elements of MDT with their respective percent distributions were

*Administrative time may be estimated by assuming a Weibull distribution function and proportional to repair time. Reference: Reliability Engineering, Arinc Research Corp., New Jersey, Prentice-Hall, 1968.

determined and are tabulated below:

ITEM	HOURS	PERCENT
Repair Time/yr.	171	4.7
Logistics Delay Time/yr.	3261.2	90
Administrative Time/yr.	51	1.4
PMS 1 yr.	137.8	3.8
Total Down Time	3621	100

3.5 HIGH FAILURE COMPONENTS IN THE AN/WLR-1G

Key failures which impact both MTTR and MTBF are as follows:

- One half of repair actions (22 out of 44) over a 30 month period were associated with the IP-480 display. These took 7.1 hours on average to repair, or 156.2 hours (Table 3-3)
- Converter CV-742 is the unit showing the longest repair time. This
 is 16.4 hours MTTR. Three repair actions were involved causing a
 49.2 hour experience (Table 3-3).
- 3. Tubes account for 50% of system failures RV resistors account for 24% of system failures (Of 104 variable resistors, 68 are in the IP-480)

These data are derived from both the 3-M field data and predictions based on Mil-Handbook 217B. Table 3-11 provides a comparison of the distribution of failures based on field data and Mil-Handbook analysis. Although the actual numerical values differ, the proportions seem to track quite well for most of the units. The greatest disparity is found in the failures for the band 9 tuner. The field failures found were mostly in the regulator subassembly. A more in-depth study of the regulator problem is currently under study by Naval Ship Engineering Center, Norfolk the cognizant field activity for the AN/WLR-1G.

TABLE 3- 11

AN/WLR-1G FIELD DATA vs PREDICTED FAILURE RATE

		% OF TOTAL SYS	TEM FAILRUE RATE
UNIT	DESCRIPTION	FIELD DATA	ANALYTICAL
* CV-732D	Tuner	5.10	2.37
* CV-733D	Tuner	2.04	2.35
* CV-734D	Tuner	5.10	2.37
* CV-735D	Tuner	2.04	2.36
* CV-736D	Tuner	2.04	5.32
* CV-1159A	Tuner	4.08	2.76
* CV-1160A	Tuner	6.12	2.79
* CV-1161A	Tuner	2.04	2.60
CV-1162A	Tuner	6.12	2.61
CV-741D	Freq. Converter	9.18	7.43
CV-742D	Freq. Converter	6.12	8.36
IP-480	Pulse Analyzer	24.49	26.24
C-2697G	Control Storer	6.12	6.93
RF-89D	Freq. Discriminator	0	7.47
PP-2156D	Power Supply	3.06	5.97
PP-2157D	Power Supply	8.16	10.10
J-1008C	InterconnectBox	2.04	0.41
SA-608C	Ant. Switch	0	0.17
* SG-333D	Pulse Generator	3.06 (test	equip.) -
Rack 20	Elect. Cabinet	0	0.20
Rack 21	Elect. Cabinet	0	0.17
Rack 22	Elect. Cabinet	0	0.19
Rack 23	Elect. Cabinet	0	0.18
Rack 24	Elect. Cabinet	0	0.19
Rack 25	Elect. Cabinet	0	0.33
Rack 26	Elect. Cabinet	0	er artis - economi
SA-609C	Ant. Switch	0	0.14
SA-616C	R.F. Switch	2.04	0.05
SA-608C	Ant. Switch	2.04	0.18
		100.0	100.0

^{*}Not pertinent to the current study.

A review of the 3-M Reports for the AS-899 antenna showed an MTBF of 704 hours versus 1420 derived by the handbook prediction method. The 3-M Reports used, covered a 2 1/2 year period from 1976 through June 1978 and was applicable only to the AS-899 E and F configuration.

The data on the antenna were investigated to attempt to determine if the fiber/
metal gears used in the drive train experienced a higher failure rate than estimated.
The data did not show the gears to be a troublesome area but rather the couplings.
Further investigation revealed that this indication is supported by opinion of personnel involved in maintenance of this equipment,* and coupling failure was attributed to erroneous installation during repair. The metal couplings are used to connect the removable sections of the drive train such as synchro and motor shafts to the main drive. Here again a more in-depth study of the coupling mechanization may be required to determine the nature of the problem.

^{*}Personnel at Navelex Supply, San Diego, were asked about gear failure experience and revealed instead that couplings failed often due to erroneous installation.

4.0 STUDY OF THE AN/SLQ-32(V)2

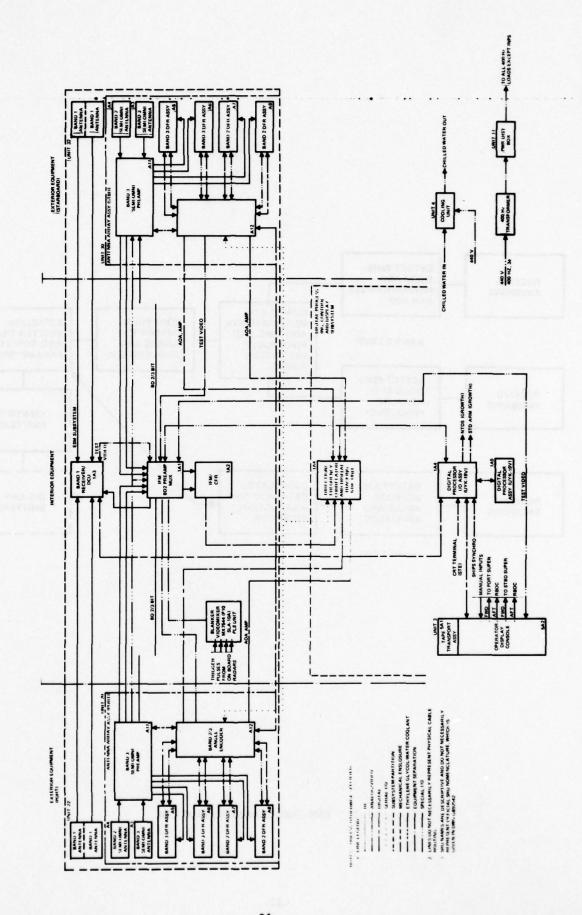
The SLQ-32(V)2 at this time is in the early operational evaluation phase. Evaluation of the first article production model of each suite will be starting very shortly, therefore, its evaluation for purposes of this report relies very heavily on information gained from other engineering analyses and the Technical Manuals.

4.1 SYSTEM DESCRIPTION

The SLQ-32(V)2 is a passive ESM system providing automatic threat acquisition identification and display. Figure 4-1 provides a functional block diagram of the system. Figure 4-2 provides an overall functional descriptive block diagram. A thorough and detailed functional description is found in reference 1; however, for background purposes of this report, some description significant to this report is reiterated here.

Signals are received via a fixed antenna array system. The antenna system is divided into four multibeam antenna arrays and two semi-omnidirectional antennas to cover bands 2 and 3. Four spiral antennas are used for band 1. The multi-beam arrays provide direction finding redundancy and graceful degradation as discussed in Section 4.2.2. Frequency information is processed through omni antennas and the IFM sections (1Al and 1A2) and fed to the computer for digital processing. Amplitude and angle information is correlated in the Angle Encoder and fed into the computer for digital processing. The digital subsystem, consisting of 1A4, 1A5, 1A6 and 2A5 provides the automatic threat identification processing for storage and display to the operator.

Although the Technical Manual does not describe separate modes of operation for the AN/SLQ-32(V)2, it may be separated into three functional schematic loops. The three



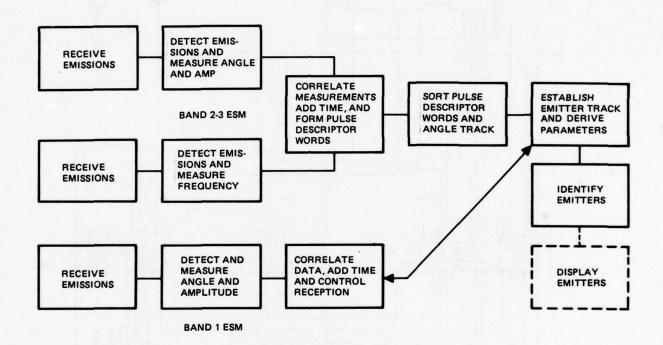


Figure 4-2. ESM Functional Operation

loops are DF, Frequency Measurement and Band 1 Reception. In this report, the loops will be designated as the DF Mode, Frequency Measurement (Acquisition) Mode and Band 1 Reception Mode. DF Mode results in the determination of threat bearing of emitters in bands 2 and 3. The Frequency Measurement (Acquisition) Mode results in the determination of the frequency and pulse parameters of band 2 and 3 emitters. Band 1 Reception Mode detects, determines bearing and provides analysis of emitters in band 1.

4.1.1 OPERATIONAL REQUIREMENTS

Operation of the system requires a three shift watch by operators trained to perform unscheduled maintenance. Much of the system operation is conducted automatically using the software program stored in the computer. The operator's function is to start or stop operation, load the computer program when needed, evaluate the tactical situation and to enter data into or give commands to the system via the computer. The computer provides "prompting" when data is needed from the operator. The operator may enter direct commands into the computer to override certain automatic functions when required. The system controls, indicators, and monitor are located on the Display Console (5A2, figure 4-1). The detailed function of each control and indicator is provided in reference 1 (Technical Manual).

System design is based on a modularity concept. It is intended to have organizational support by replacement of Ship Replaceable Assemblies (SRA) such as printed circuit cards, RF modules and power supply assemblies. Repairable SRA's will be returned to the depot for repair. A minimum of intermediate repair will be performed on-board ship and limited to replacement of connectors, repairing broken wires, solder connections and similar corrective maintenance. Although support is currently being handled by the contractor, the deployment stage support is to be determined by the Navy at a later date. This study assumes the Navy will support the deployment

stage. Appendix B of reference 2 includes a listing of units, assemblies and piece parts. Suite 2 includes approximately 430 SRA's.

4.2 RELIABILITY ASSESSMENT

The AN/SLQ-32(V) is currently going into evaluation of the first-article production model. Field data of the production configuration is non-existent and a limited amount of data is available on the prototype model. This reliability evaluation, therefore, is heavily dependent upon earlier engineering analyses.

4.2.1 FAILURE ASSESSMENT FROM FIELD DATA

The prototype AN/SLQ-32(V) equivalent to suite 3, compiled 1034 operating hours of TECHEVAL operation (reference 3) on board the USS Leahy. Some additional operation was gained on board the USS Virginia, however, results of that evaluation were not available in time for this report. Operation on board the Leahy reported eight maintenance actions against the ESM portion of the system. Of these 8, two were reported as failures which would have resulted in loss of mission performance capability yielding an observed MTBF of 517 hours. Table 4-1 provides a summary of the results. Because of the short duration of evaluation and only two failures, the observed MTBF was not considered applicable for this study. Moreover, the failures are probably representative of early life failures rather than random failures.

One significant observation resulting from Techeval is that there were no reported incidents of computer memory alteration. Memory retention capability provides added confidence to overall computer reliability (including computer power control logic) since memory alteration would be one of the most probable failure modes of the computer or its power source.

TABLE 4-1

AN/SLQ-32(V) PROTOTYPE TECHEVAL DATA SUMMARY

ESM Operating Hours	1034 hours
ESM Total Maintenance Actions	8
ESM Maintenance Actions considered major failures	2
ESM Maintenance Actions considered minor failures	3
ESM Maintenance Actions considered preventive maint.	3
ESM Total Major Failure corrective maintenance time	3.96 hours
ESM Total Minor Failure corrective maintenance time	5.2 hours
ESM Total Preventive Maintenance time	.76 hours
*Observed ESM MTBF	517 hours
*Observed ESM Mean corrective maintenance time	1.98 hours
*Observed ESM inherent availability	0.996

*Based on 2 major failures which prevented ESM mission accomplishment.

4.2.2 FAILURE ASSESSMENT BY MIL HANDBOOK PREDICTION

A reliability prediction has already been prepared by the contractor for the AN/SLQ-32(V). Because of its voluminous size, the complete prediction is not included in this report, but is summarized for ease of reference. The complete prediction is contained in Appendix C of reference 4. The method used to determine part failure rates was according to section 2 of MIL-HDBK-217B, Part Stress Analysis Prediction.

Table 4-2 provides the summary of failure rates applicable to each functional block of the AN/SLQ-32(V)2. The portion of the system comprising each block is also identified. All blocks have a duty cycle of 1.0 except for the tape transport unit in block K. It has been assessed that this unit is used 10% of the time.

The assumptions and conditions used in determining reliability for this study were:

- (a) The ESM system is required to operate 100% of the mission time.
- (b) Mission success is defined to be threat location and identification within the system specifications given in Specification ELEX-C-243C, paragraph 3.2.1 and Table III.
- (c) The system is capable of performing a successful mission under the graceful degradation specified in ELEX-C-243C, paragraph 4.5.3.1 and listed here in Table 4-3.

Figures 4-3, 4-4, 4-5 and 4-6 are the reliability block diagrams for the AN/SLQ-32(V)2 ESM system. As seen in figure 4-3, system redundancy is provided in blocks A through D for the DF Mode of Operation. (Redundant elements are indicated by the lower case letters). The numbers in the brackets at the bottom of the blocks indicate the degree of graceful degradation. For block A there are a total of 38 A₁ elements and any combination of 35 or more elements operating (with three or less in a failed state) will provide operation with some degradation. Thus, 35 out of 38 are required for mission success even though some degradation of performance occurs, reference table 4-3.

Table 4-2 Reliability Model Block Identification and Failure Rate Summary

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3.4

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d'e

ВГОСК	CONTENTS OF BLOCK	ITEM PART NUMBER	λ(FAILURES/10 ⁶ HOURS)
٧	BAND 2 BEAM FORMING ELEMENT	igit vesse	B. 1.5
	(1) Antenna array element	Part of 927418-1	0.595
	(2) Input port of beam forming lens	Part of 927419-1	0.588
	(teleproper of Dept.) Charles dept. that a Charles and the contract of		
В	BAND 2 BEAM SELECTION ELEMENT		029.829
	(1) Output port of beam forming lens	Part of 927419-1	0.588
	(2) RF module	928307-1	14.358
၁	BAND 3 BEAM FORMING ELEMENT	F-07000	102.5
	(1) Antenna array element	Part of 928414-1	0.595
	(2) Input port of beam forming lens	Part of 927415-1	0.588
		7-886-50	33.388
Q	BAND 3 BEAM SELECTION ELEMENT		
	(1) Output port of beam forming lens	Part of 927415-1	0.588
	(2) RF module	928308-1	10.243

Table 4-2 Reliability Model Block Identification and Failure Rate Summary

BLOCK	CONTENTS OF BLOCK	ITEM PART NUMBER	(FAILURES/106 HOURS)
ы	NON-REDUNDANT PORTION OF QUADRANT		
	(1) Band 2 DF Receiver excluding items covered in a_1 and b_1 above	926989-1	18.209
	(2) Band 3 DF Receiver excluding items covered in $c_{\bf i}$ and $d_{\bf i}$ above	926988-1	23.368
	λE		41.577
ĵt.	EXTERIOR ESM EXCEPT ITEMS COVERED BY a ₁ THRU E ABOVE		
	(1) Antenna-radome assembly, semi-omni	845676-2	0.501
	(1) Antenna-radome assembly, semi-omni	845676-1	i05.0
	(2) Antenna assembly - band 1	849218-1	1.002
	(3) Amplifier, radio frequency		
		926484-2	227.050
	(4) Processor, signal data (angle encoder)		
		926996-1	191.877
	(5) Enclosure		
		926975-1	34.854
	A F		455.785

Table 4-2: Reliability Model Block Identification and Failure Rate Summary

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Ŋ	INTERIOR ESM		
	(1) IFM, Preamp MUX		
		926997-2	436.464
	(2) CFR (Coarse frequency receiver)		268.811
	<pre>Kecelver, countermeasures (Band 1 receiver/DCU)</pre>	926990-1	449.180
	γ ^c		1154.455
H	PROCESSOR, SIGNAL DATA AND CORRELATOR	926994-2	209.957
	界 大		209.957
J	COMPUTER AND COMPUTER INTERFACE		
	Computer, digital	929010	473.220

	Interface, computer	928399-1	12.111
	Cabinet, rack 1	926488-1,-2,-3	20.103
	$\gamma_{\mathbf{J}}$		505.434

Table 4-2: Reliability Model Block Identification and Failure Rate Summary

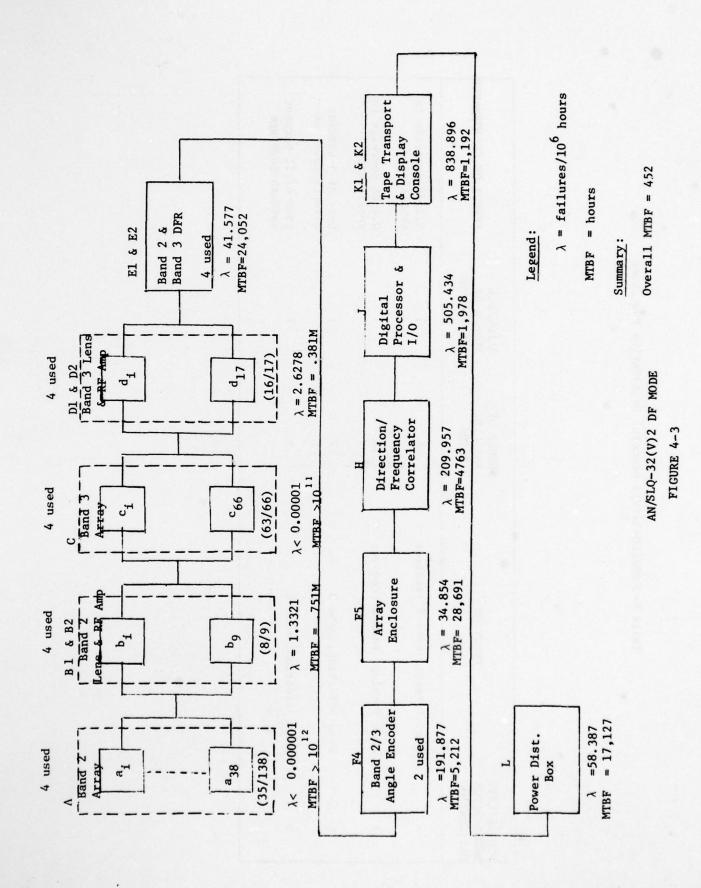
λ (FAILURES/10 ⁶ HOURS	City, by	819.650	19.110*	0.145		58.387	58.387	
ITEM PART NUMBER	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	848066-1	926910-1	929171-1		926966-1		The state of the s
CONTENTS OF BLOCK	CONSOLE	(1) Console - display	(2) Tape transport	Footswitch	DISTRIBUTION BOX, POWER		7 r	
ВГОСК	ж.				1			

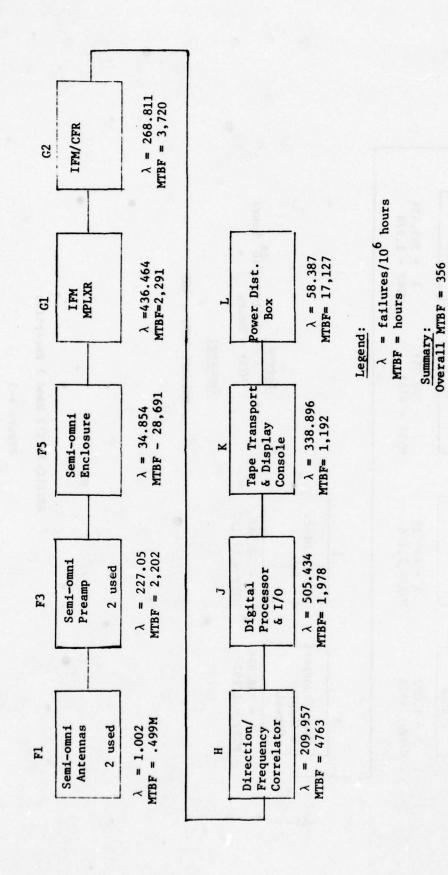
*10% duty cycle factor included

Contract Contracts

Table 4-3 AN/SLQ-32(V)2 Graceful Degradation Functions

RELIABILITY MODEL BLOCK DESIGNATION	FUNCTION	NUMBER OF PARALLEL PATHS	ALLOWABLE NUMBER OF FAILED PATHS	EFFECT ON PERFORMANCE
A	Beam forming, band 3 receiver	99	e,	0.2 dB decrease in sensitivity
æ	Beam forming, band 2 receiver	38	Е	0.4 dB decrease in sensitivity
v	Beam selection, band 3	17	1	Loss of 5 percent azimuth coverage
Q	Beam selection, band 2	6	1	Loss of 11 percent azimuth coverage



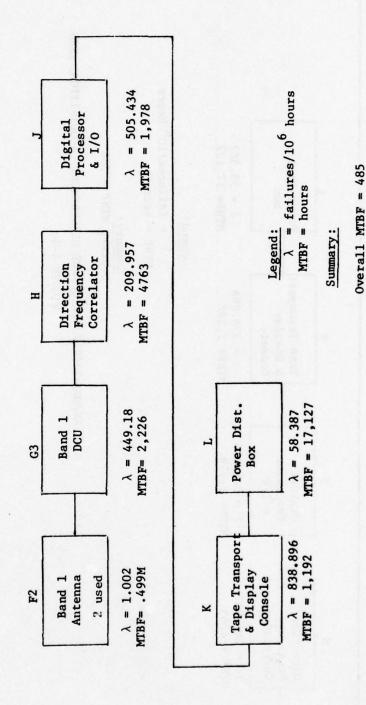


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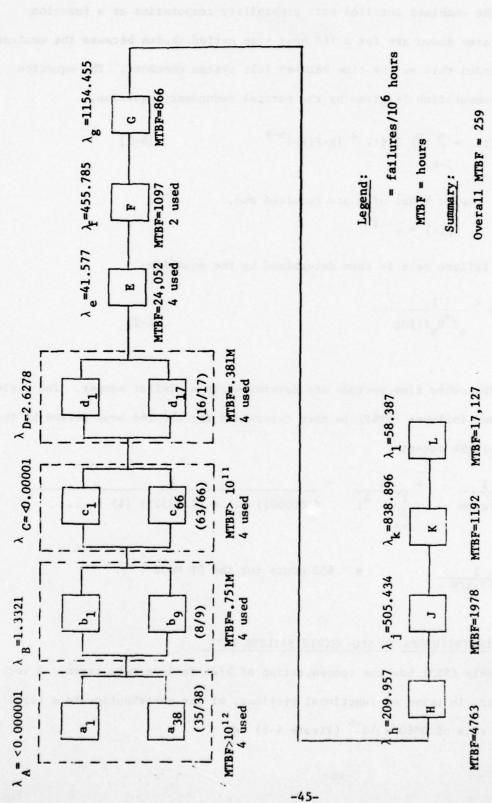
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AN/SLQ-32(V)2 FREQUENCY MEASUREMENT (ACQUISITION) MODE FIGURE 4-4



AN/SLQ-32(V)2 Band 1 Reception



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Reliability Block Diagram SLO-32(V)2 Combined Modes Figure 4-6

The failure rates given in figure 4-3 and 4-6 for blocks A, B, C and D are determined by the combined parallel path probability computation as a function of time. The rates shown are for a 168 hour time period chosen because the contractor has recommended this as the time between full system checkout. The equation used for this computation is given by the partial redundancy equation,

$$R_{N}(t) = \sum_{k=0}^{m} {m \choose k} P(t)^{k} [k-P(t)]^{m-k}$$

$$1 = k$$

$$1 = k$$

$$1 = k$$

where: k out of m are required and,

$$p(t) = e^{-\lambda t}$$

The equivalent failure rate is then determined by the equation;

$$\lambda_{N} = \frac{1}{o^{\int_{0}^{\infty} R_{N}(t) dt}}$$
 [4-2]

Failure rates for other time periods are determined in a similar manner. The system mean-time-between failures (MTBF) is then determined for the 168 hour period by the summation of failure rates;

MTBF =
$$\frac{1}{\lambda_{\text{system}}}$$
 = $\frac{1}{\sum_{\Sigma}^{L} \lambda_{\text{i}}}$ = $\frac{1}{(.000001)(4) + (1.33321)(4) +}$
= $\frac{1}{3213 + 320}$ = 452 hours for the DF Mode

4.2.3 HIGHEST CONTRIBUTORS TO SLQ-32(V)2 FAILURE RATE

No single assembly (SRA) has the concentration of high failure rate items. A very course breakdown, in terms of functional sections, of the contribution to a total system failure rate of 3860×10^{-6} (Figure 4-6) is:

RF	43%
Power Supplies	24%
Display	21%
Computer	12%

The power supplies consist of 18 AC to DC power supplies and 17 regulator assemblies. In the display the CRT appears to be the only single part type with a high contribution to failure rate (After semiconductors and integrated circuits). The computer is composed primarily of ICs and the core memory which contributes about 33% of the 485.3 failures/10⁶ hour failure rate.

In the RF section, some of the portions showing a high contribution to failure rate are the IFM-Preamp-Multiplexer, CFR, DCU and Angle Encoder. Except for Integrated Circuits (IC's) none of those units appear to have a high concentration of high failure rate components. Among RF oscillators, directional couplers, attenuators and filters, the failure rates are well distributed. Overall, there are approximately 5000 IC's used in suite 2 with an assigned failure rate of 0.1034 failures/10⁶ hours. This amounts to approximately 13% of the total system failure rate. However, these 5000 IC's are well distributed among units of the system.

4.3 MAINTAINABILITY ASSESSMENT OF THE AN/SLQ-32(V)2

The maintainability assessment of the AN/SLQ-32(V)2 relied heavily on the technical analysis already performed by the contractor. The maintainability assessment was directed mainly toward identifying the associated repair times of the functional blocks making up the suite 2 model. Within the functional blocks, there are a total

of 432 ship replaceable assemblies (SRA's) Table 4-4 provides a breakdown of the locations of the units and SRA's. The SLQ-32(V) maintenance design concept is to repair by replacement of modules (SRA's) on board ship. The units range from 3/4 to 1 1/2 ATR size units. Access to SRA's in Rack 1 is by loosening swing bolt nuts, sliding out unit, removing unit covers held with quick removal Dzus fasteners and SRA removal. Access to SRA's in the Console is by removal of 8 front panel quick disconnect type screws and sliding out console unit. Access to exterior SRA's is by opening hinged antenna enclosure panels, disconnecting and tagging cables, loosening swing bolts and removing entire assembly. Assembly covers, cables and SRA holding screw are then removed.

4.3.1 REPAIR-TIME EVALUATION FROM FIELD DATA

At the time of this study, the only field data available on equipment repair-time was from Techeval (reference paragraph 4.2.1). In addition, the repair-time data measured for 39 maintenance actions and 24 tasks performed during maintainability demonstration testing was also available. Of these, it was determined that 8 maintenance actions and 16 demonstration tasks were for equivalent suite 2 ESM hardware. The data was tabulated and is shown in Tables 4-5 and 4-6.

Table 4-5 is a summary of the observed repair time for correction of the faults that occurred during the Techeval program aboard the USS Leahy. Table 4-5 also compares the observed repair time to the repair time shown derived by Mil-Handbook prediction. Table 4-6 is a summary of the observed repair times (corrective maintenance times) from the specified maintenance tasks performed during the Maintainability Demonstration Test, reference 3. Table 4-6 also provides the predicted repair time for comparison. Demonstration data shows observed MTTR better than predicted values. Maintenance tasks during Techeval (Table 4-5)

TABLE 4-4

AN/SLQ-32(V)2 SYSTEM CONSTRUCTION

	EXTERIOR EQUIPMENT		
PORT	DESCRIPTION	STAR	BOARD
UNIT 22 No SRA	Band 1 Antennas (mast)	Unit 32 No SRA	
UNIT 20 A1 8 SRA's	Array Antenna Assemblies Array Antenna Enclosures Chasis Parts	Unit 30 8 SRA's	Al
A3 1 SRA A4 1 SRA A5 22 SRA's A6 22 SRA's A7 14 SRA's A8 14 SRA's	Semi-omni Antenna Semi-omni Antenna Band 3 DFR Band 3 DFR Band 2 DFR Band 2 DFR	1 SRA 1 SRA 22 SRA's 22 SRA's 14 SRA's 14 SRA's	A3 A4 A5 A6 A7 A8
A11 10 SRA's A12 29 SRA's	Semi-omni Preamp Angle Encóder	10 SRA's 29 SRA's	A11

INTERIOR EQUIPMENT - EW ROOM

UNIT 1	RACK 1
Al 15 SRA's	IFM Multiplexer
A2 15 SRA's	IFM CFR
A3 22 SRA's	Band I Receiver, DCU
A4 48 SRA's	Direction/Frequency Corelator
A5 38 SRA's	Digital Computer, CP-1374
A7 7 SRA's	Rack 1 Power Distribution Box
UNIT 4	Heat Exchanger (optional)
UNIT 11	Power Distribution Box
7 SRA's	Chassis parts
	INTERIOR EQUIPMENT - CIC ROOM
UNIT 5	Operator Display Console
Al 4 SRA's	Tape Transport Assembly
A2 34 SRA's	Console

TABLE 4 - 5

AN/SLO-32(V) TECHEVAL OBSERVED REPAIR TIME

MAINTENANCE ACTION	XN-1 OBSERVED	(V)2 PREDICTED
XN-1 MINOR FAILURES	REPAIR TIME (HR)	REPAIR TIME (HR)
Display Console 4k x 16 Mem. Module 7A5A17	0.5	0.52
Unit 20 Band 2 DFR, CVR 20A12A10	1.5	1.13
Unit 30 Band 2 DFR, MPLXR 30A10A6	3.2*	1.28
XN-1 MAJOR FAILURES	6 / ME C	dia .
Unit 1 Memory Card 1A1A2A8	1.75	0.77
Unit 2 IFM Pre Amp 2AlA3V2	2.21	No equiv found
XN-1 PREVENTIVE ACTION		
Display Console Trace Alignment	0.16	
Unit 2 IFM Sensitivity Adjust.	0.5	-
Display Console Filter	0.1	
*Added 17.3 hour delay time recorded	6,483	

TABLE 4-6
AN/SLQ-32(V) MAINTAINABILITY DEMONSTRATION DATA
DEMONSTRATED REPAIR TIMES

UNIT	FAILURE SYMPTOM	DEMONSTRATED MAINTENANCE	AN/SLQ-32-(V)2 PREDICTION
		TIME (Hrs)	30 JULY 78 (Hrs)
IFM MUX 1A1A3	SOT + 28V Power Supply	.61	.93
Display 5A2	Bright/Dim Characters (CARD)	.16	. 52
SIOC 1A4	SDT-Serial Message (CARD)	.3	0.7
BD 3 DFR 20/	s vocal sums to sound to TTE usual su	IIX comp. nodata	Weills area
30A5/6	+5V Power Supply (Outside)	. 64	.13
BD 3 DFR 20/30A5/6	+5V Power Supply (Outside)	.97	.13
IFM MUX 1A1A3	SOT + 15V Power Supply	.93	0.93
Display 5A2	No Circle Format (CARD)	.16	.52
SIOC 1A4	SDT Serial Message (CARD)	.45	.7
(V)3 TGU	SOT IND + 15V Power Supply		<u>-</u>
SIOC 1A4	SDT Serial Message (A-15) CARD)	.37	.7
(V)3 TGU	SDT SSW (A-20 CARD)		
DFC/DTU 1A4	Process Control (A-6 CARD)	.25	.7
SIOC 1A4	SDT Serial Message (A-15 CARD)	.23	.7
(V)3 TGU	SOT-HDT (A-4 CARD)		MILES CALL
DFC/DTU 1A4	Frequency TOL (A-15 CARD)	.2	.7
IFM/CFR 1A2	SOT-12V Regulator (A-13 CARD)	1.2	1.16
BD 2 DFR 20/			
30A7/8	-12V Regulator (Outside)	.65	.13
IFM MUX 1A1	SOT (CARD)	.21	.93
IFM PREAMP	SOT +28V Power Supply	.48	and resting
SIOC 1A4	Loose Cable Connector J-8	.18	•
(V)3 TGU	SDT SSW (CARD)		-SHE PAY SET
Display 5A2	A/N MEMORY (CARD)	. 27	.52
(V)3 XMTR	TWT (BOTTOM)	in democrats are a	smooth Eight J. Ad
(V)3 XMTR	TWT (BOTTOM)	<u>-</u>	-

show repair-times about equivalent to predicted values.

4.3.2 REPAIR-TIME EVALUATION BY MIL HANDBOOK PREDICTION

The maintainability prediction is provided in reference 2, Maintainability Prediction Report, CDRL A00V. The technique was based on MIL-HDBK 472. Assigned elemental task times (such as assembly/disassembly interchange times) were either taken from MIL-HDBK 472 or based on knowledge and experience with the equipment. The resultant overall MTTR from this prediction is 1.045 hours. For purposes of this study, repair-times for the corresponding blocks of Table 4-2 were extracted from the prediction and are listed in Table 4-7. The Band 1 Antenna and the Console Footswitch were assigned a repair time of 720 hours because they are not designated ship replaceable items and it was estimated the ship would return to port after 30 days.

4.3.3 ESTIMATED DOWN TIME

Although support for the evaluation stage is currently being handled by the contractor, support of the deployment stage has not been defined. As a result, the current Navy support conditions applicable to the AN/WLR-IG are assumed for this study. The delay time of 49 hours estimated for the WLR-IG Receiver (Table 3-5 and section 3.3.2) was incorporated into Operational Availability calculations for the AN/SLQ-32(V)2. By adding this delay time of 49 hours to the MTTRs given in Table 4-7, the resultant MDT used in the projected field operational availability calculations is determined by (MDT = MTTR + Delay Time).

4.4 AVAILABILITY OF THE AN/SLQ-32(V)2

The same approach used for determining availability indices for the AN/WLR-1G was used for AN/SLQ-32(V)2. Predicted repair-times (MTTR) were used to calculate

TABLE 4-7
AN/SLQ-32(V)2 PREDICTED REPAIR TIMES

BLOCK	UNIT/SRA	REPAIR TIME (Hrs.)
A land only by M. S.W.	P/O 20A7, Band 2 Array	2.44
B and to program and	P/O 20A7, Band 2 Lenses	2.44
В	20A7,11,12 Band 2 CVR	.56
C C C C C C C C C C C C C C C C C C C	P/O 20A5, Band 2 Array	2.84
D animals makes execute	P/O 20A5, Band 2 Lenses	2.84
D	20A5 A2, Band 3 CVR	.56
E 1	P/O 20A7, 8, Band 2 DFR	1.35
E 2	P/O 20A5, 6, BAnd 3 DFR	1.51
F 1	20A3, Semi-omni	2.73
F 1	20A4, Semi-omni	2.73
F 2	Unit 22, Band 1 Antenna	720*
F 3	20A11, Band 2, 3 RF Amp	1.36
F 4	20A12, Angle Encoder	1.04
F 5	20Al, Exterior Enclosures	0.58
G 1	1A1, IFM-MPLXR	1.3
G 2	1A2, CFR	1.04
G 3	1A3, Band 1 DCU	1.01
Н	1A4, Correlator	0.73
ofte J Francisco boise,	1A5, 7 Comp., I/O	0.89
к1	5A1, 2 Tape Trans & Consc	ole 0.69
к2	Footswitch	720*
L	Unit 11, Power Dist.	0.36

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inherent availability and operational support logistics delay reflected in the WLR-1G field data (Table 3-5) was used to calculate AN/SLQ-32(V)2 operational availability. For the AN/SLQ-32(V)2 ESM, the following statement of conditions are given:

- Models used for availability for the AN/WLR-1G are also applicable to the AN/SLQ-32
- A successful mission may be achieved for the duration of the mission even though graceful degradation has occurred.
- Spares availability is such that on the average 49 hours of logistics delay occur for each failure over a 1 year period*.

Finally, the availability calculations for the separate modes (Tables 4-8 through 4-11) were computed by means of the math models presented in Appendix D.

4.4.1 DISCUSSION OF AVAILABILITY RESULTS

The resultant calculations of availability are shown in Tables 4-8 through 4-11

The change in inherent availability over the 7 to 365 days is seen to occur only

for the DF mode and combined mode operation. This effect is due to the fact that

the failure rate for blocks A, B, C and D are the only significant parameter

changes with time. A steady state inherent availability has been reached at

7 days and only the small increase in failure rate for blocks A through D are reflected

in the calculations. Because of this effect, steady state inherent availability

(A_I steady state) may be approximated by the steady state equation,

 A_{I} steady state $\frac{\text{MTBF}}{\text{MTBF}} + \text{MTTR}$

*Because delay time was only known for a one year period, Operational Availability was not calculated for other periods.

TABLE 4 - 8 AN/SLQ-32(V)2 DF Mode Availability

Total S

School of the second

																365 DAYS	.99804375	.82210941	
DOWN TIME (HRS)	51.44	51.44	49.56	51.84	51.84	49.56	50.35	50.51	50.04	49.58	49.73	68.65	69.65	720	49.36				
REPAIR TIME (HRS.)	2.44	2.44	.56	2.84	2.84	.56	1.35	1.51	1.04	.58	.73	68.	69.	720	.36	180 DAYS	.99807102	Ē	
QTY USED	4	4	4	4	4	4	4	4	2	1	1	1	1	1	1	18	6.		
No. of PARALLEL PATHS	35/38	6/8	6/8	99/69	16/17	16/17	0	0	0	0	0	0	0	0	0	90 DAYS	89060866	1	
F/10 ⁶ HRS.	1.183	0.588	14.358	1.183	0.588	10.243	18.209	23.368	191.877	34.854	209.957	505.434	838.751	0.145	58.387				
DESCRIPTION	BAND 2 ANTENNA ARRAY & LENS INPUT	BAND 2 LENS OUTPUT	BAND 2 CVR	BAND 3 ANTENNA ARRAY & LENS INPUT	BAND 3 LENS OUTPUT	BAND 3 CVR	BAND 2 DFR Not in blocks A-D	BAND 3 DFR Not in blocks A-D	ANGLE ENCODER	ARRAY ENCLOSURE	DIRECTION/FREQUENCY COORELATOR	DIGITAL PROCESSOR & 1/0	TAPE TRANSPORT & DISPLAY CONSOLE	FOOT SWITCH	POWER DISTRIBUTION BOX	7 DAYS 30 DAYS	TY .99811606 .99809068	ILITY —	
REJ. BLOCK	A BAI	B 1 BAN	B 2 BAN	C BAI	D1 BAI	D2 BAN	E1 BAN	E2 BAN	F4 AN	F5 ARI	H DI	J DIG	K1 TAI	K2 F00	J. POI	PARAMETER	INHERENT AVAILABILITY	OPERATIONAL AVAILABILITY	

TABLE 4 - 9

AN/SLQ-32(V)2 Frequency Measurement (Acquisition) Mode Availability

DOWN TIME (HRS)	51.73	50.36	49.58	50.3	50.04	49.73	49.89	69.65	720	49.36
REPAIR TIME (HRS.)	2.73	1,36	.58	1.3	1.04	.73	.89	69.	720	.36
QTY USED	2	2	1	1	1	-	1	1	1	1
No. of PARALLEL PATHS	0	0	0	0	0	0	0	0	0	0
F/10 ⁶ HRS.	1,002	227.05	34.854	436.464	268.811	209.957	505.434	838.751	0.145	58.387
DESCRIPTION	SEMI-OMNI ANTENNAS	SEMI-OMNI PREAMPS	SEMI-OMNI ENCLOSURE	IFM MPLXR	IFM/CFR	DIRECTION/FREQUENCY CORRELATOR	DIGITAL PROCESSOR & 1/0	TAPE TRANSPORT & DISPLAY CONSOLE	FOOT SWITCH	POWER DISTRIBUTION BOX
REL BLOCK	딢	F3	F5	5	62	н	ר	KI	К2	T

PARAMETER	7 DAYS	30 DAYS	90 DAYS	180 DAYS	365 DAYS
INHERENT AVAILABILITY	.99706320	.99706320	.99706320	.99706320	.99706320
OPERATIONAL AVAILABILITY	Y				870554.85

TABLE 4- 10 AN/SLQ-32(V)2 Band 1 Reception Availability

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TIME TIME (HRS.)	720 720	1.01 50.01	.73 49.73	.89 49.89	69.67 69.	720 720	.36 49.36	AYS 2220	4184
QTY T USED (H)	2	1 1	1	1	1	1	1	365 DAYS 0.99802220	.90234184
PARALLEL PATHS	0	0	0	0	0	0	0	180 DAYS	1
F/10 ⁶ HRS.	1.002	449.18	209.957	505.434	838.751	0.145	58.387	90 DAYS	1
DESCRIPTION	BAND 1 ANTENNA	DCU	DIRECTION/FREQUENCY COORELATOR	DIGITAL PROCESSOR & 1/0	TAPE TRANSPORT & DISPLAY CONSOLE	VITCH	POWER DISTRIBUTION BOX	7 DAYS 30 DAYS •99802220 .99802220	ŀ
	BAND 1	BAND 1 DCU	DIRECT	DIGITAL	TAPE TE	FOOT SWITCH	POWER I	ABILITY	OPERATIONAL AVAILABILITY
BLOCK	F2	63	-	-	מ	K2	.,	PARAMETER RENT AVAII	IONAL !

TABLE 4 - 11

AN/SLQ-32(V) 2 System Availability

REI. BLOCK		DESCRIPTION	F/10 ⁶ HRS.	No. of PARALLEL PATHS	QTY USED	REPAIR TIME (HRS.)	DOWN TIME (HRS)
٧	BAND 2 ANTENN	2 ANTENNA ARRAY & LENS INPUT	1.183	35/38	4	2.44	51.44
8	BAND 2 LENS OUTPUT	UTPUT	0.588	6/8	4	2.44	51.44
В	BAND 2 CVR		14.358	28	4	.56	49.56
ပ	BAND 3 ANTENN	BAND 3 ANTENNA ARRAY & LENS INPUT	1.183	99/69	4	2.84	51.84
Q	BAND 3 LENS OUTPUT	UTPUT	0.588	16/17	7	2.84	51.84
Q	BAND 3 CVR		10.243	16/17	7	.56	49.56
E1	BAND 2 DFR No	BAND 2 DFR Not in blocks A-D	18.209	0	4	1.35	50.35
E2	BAND 3 DFR No	BAND 3 DFR Not in blocks A-D	23.368	0	4	1.51	50.51
F1	SEMI-OMNI ANTENNA	ENNA	1.002	0	2	2.73	51.73
F2	BAND 1 ANTENNA	A	1.002	0	2	720	720.
F3	SEMI-OMNI PREAMP	AMP	227.05	0	2	1.36	50,36
F4	ANGLE ENCODER		191.877	0	2	1.004	50.004
F5	EXTERIOR ENCLOSURE	LOSURE	34.854	0	2	.58	49.58
61	IFM MPLXR		436.464	0	1	1.3	50.3
G2	CFR		268.811	0	1	1.04	50.04
63	BAND 1 DCU		449.18	0	-	1.01	50.01
н	DIRECTION/FRE	DIRECTION/FREQUENCY CORRELATOR	209.957	0	1	.73	49.73
ſ	DIGITAL PROCESSOR & 1/0	SSOR & I/O	505.434	0	-	.89	68.65
KI	TAPE TRANSPOR	TAPE TRANSPORT & DISPLAY CONSOLE	838.751	0	1	69.	69.65
K2	FOOT SWITCH		0.145	0	1	720	720
T	POWER DISTRIBUTION BOX	UTION BOX	58.387	0	1	.36	49.36
PARAMETER	7 DAYS	S 30 DAYS	90 DAYS	180 DAYS	398	365 DAYS	
INHERENT AVAILABILITY	NBILITY .99565141	141 .99564342	.99562609	.99560648	6.	.99557928	
OPERATIONAL AVAILABILITY	VILABILITY —	:	01-100	i	.7.	.75280336	

Name of Street

where values for MTBF are taken directly from the reliability block diagrams (figures 4-3 through 4-6) and the system MTTR in Table 4-7. The steady state operational availability (A_o steady state) may be approximated by,

Ao steady state
$$\frac{\text{MTBF}^1}{\text{MTBF}^1 + \text{MDT}}$$

where values for MTBF¹ and MDT must be derived from the parameters listed in Tables 4-8 through 4-11. The derivation is shown below and the results given for only the combined mode (Table 4-11).

The DF Mode (bands 2 and 3) has the highest inherent availability figure due to the antenna array redundancy. The redundancy results in a failure rate that is lower than for the Frequency Measurement Mode or Band 1 Reception Mode.

The Operational Availability for Band 1 Reception is seen to be the highest of the three modes of operation for the AN/SLQ-32(V)2. It is interesting to note that although inherent availability is highest for the DF Mode (bands 2 and 3), operational availability is not. The reason for this effect is due to the assumptions made for operational availability, i.e., operational availability requires total system (or mode) fully up. Thus, all the blocks become series paths. To have the entire system, for example, in a fully operational condition, all block failure rates in Table 4-11 are summed and found to be 5783 failures/10⁶ hours, or, 173 hour MTBF. The associated MDT is found to be 50 hours by taking the average of the failure-rate-weighted down times in Table 4-11, and, the approximate steady state operational availability is;

A_o steady state $\frac{MTBF^{1}}{MTBF^{1} + MDT}$ $\frac{173}{173 + 50} = 0.776$

The added effect of using non-ship-repairable items (band 1 antenna and the foot switch) may be assessed by comparing the inherent availability for Band 1 Reception (Table 4-10) with the availability computation excluding the two items. Band 1 Reception availability for a 7 day period and excluding blocks F2 and K2 in Table 4-10 is 0.99834522 compared to 0.9980222 for the complete Band 1 availability in Table 4-10. The effect would be even less for the other modes considered.

5.0 RESULTS AND CONCLUSIONS

The objective of this study was an attempt to form the most representative availability models of the AN/WLR-1G and the AN/SLQ-32(V)2 in order to obtain insight into the areas that significantly affect availability of an ESM equipment. By concentrating on these areas, future improvements to ESM availability may be pursued in an effective manner. In this regard, the current study will serve as a "baseline" for the ESM Availability Improvement Program.

5.1 LIMITATIONS TO AVAILABILITY OF THE AN/WLR-1G and AN/SLQ-32

A. Inherent Availability

Inherent availability is a function of both failure rate and MTTR. Thus, improvements in inherent availability must necessarily start with these factors while insuring that the stated ESM performance goals are not degraded.

In the AN/WLR-1G any improvements to inherent availability is related mainly to replacing the IP-480 by a state-of-the art IF processor and display unit. No significant improvement in inherent availability could be achieved by merely making internal modifications to the IP-480; a complete technology shift from vacuum tubes and RV resistors and CRT displays is required. In addition, circuit redundancy and self-test features throughout the AN/WLR-1G is lacking. These features should be added for additional improvement in inherent availability. A course estimate of the boundry of improvement to be expected by a new IP-480 design would be about a maximum of 144 hour MTBF for the Combined Mode (from 106 hours), assuming that the new IP-480 would have a failure rate of 1000 failures/10⁶ hours rather than 3490 f/10⁶ hours shown in figure 3-6. The power supplies and Frequency Converter (CV-742) could be improved similarly (to failure rates of 1000 and 500 failures/10⁶ hours for power supplies and

CV-742 respectively). Assuming replacement (collective improvement) of these items, the overall maximum expected system MTBF would be approximately 193 hours.

If an overall maximum MTBF of 193 hours is obtained this would (using an MTTR of 3.35 hours from Table 3-6), enhance availability as follows:

$$A_{\text{steady state}} = \frac{MTBF}{MTBF + MTTR} = \frac{193}{193 + 3.35} = 0.983*$$

The study of the AN/SLQ-32(V)2 has shown that although the complexity is high, the predicted reliability is also reasonably high. This is not meant to imply that it could not be significantly improved. The primary reason for its higher reliability is the application of digitized circuitry with its low power, low failure rate IC circuitry.

As the SLQ-32(V)2 now exists, an inherent availability of approximately 0.996 is realized. This valve may be approximated by the equation,

$$A_{\text{steady state}} = \frac{\text{MTBF}}{\text{MTBF} + \text{MTTR}}$$
 (5-1)

For an MTBF of 259 hours and an MTTR of 1 hour,

$$A_{\text{steady state}} = \frac{259}{260} = 0.996$$

In order to realize an inherent availability of 0.998, the reliability must be doubled;

MTBF = MTTR $(\frac{A}{1-A})$ steady state = 1.0 $(\frac{.998}{.002})$ = 499 hours

It is very unlikely that the SLQ-32(V)2 reliability could be doubled merely by a design change, lowering stress levels or effecting parts quality improvement. Added redundancy would probably be the most feasible method of design change to improve

*Compared to results of 0.968 from Table 3-10.

the MTBF.

Improving availability in either the AN/SLQ-32(V)2 or the AN/WLR-1G by improving maintainability may be seen as being less practical, even for the AN/SLQ-32(V)2. For example:

MTTR = MTBF $(\frac{1-A}{A})$ steady state = 259 $(\frac{.002}{.998})$ = 0.52 hours An MTTR of 0.5 hours is probably not feasible without a considerable amount of added built-in self test and re-packaging exterior equipment.

B. Operation Availability

Operational availability is a function of support and logistics in addition to failure rate and MTTR. Thus it relates to equipment design and established logistics support.

Study of the field data for the WLR-1G system showed logistics delay time (Table 3-5) accounting for most of the operational down time. This observed delay time so overwhelms the inherent repair time that it would seem futile to attempt improving the design. This conclusion, however, may not necessarily be the correct conclusion. Logistics delay may be the time spent awaiting parts, time spent awaiting technical assistance or time spent awaiting test equipment. Most often delay time is the time spent awaiting parts. The 3-M data showed that nearly 50% of the parts demanded were not on-board when required -- tubes being the highest in demand for that time period. This condition is indicative of supply constraints. No matter what is done to the design, short of making it self-healing, no significant improvement would be realized in availability with such a high delay time.

Finally, the 3-M data indicated that some parts designed into the equipment are not readily available. That is, parts are either non-standard or require unique manufacturing processes such as the gearing in the antenna or the RF modules in the tuners.

Although the parts may be obtained, often long lead times are required because a manufacturer discontinues production or is not always in production. Design of equipment with many unique or non-standard parts, therefore, may result in promoting long delays in logistics.

No reason could be found in the research of the 3-M data as to why supply line conditions exhibit the relatively long delays. It is the writer's opinion that this delay time is more reprsentative of day to day activities where little or no priority is assigned to obtain replenishments. For those failures where mission operation was critical, a normal system of priority in the naval supply system would expedite the required material at a faster rate than normal. An in-depth study of CASREP data would be required to determine if, in fact, a problem of long delay time does exist in the supply system when priority requisitions are involved.

Nevertheless, it is clear that operational availability for both the AN/WLR-1G and the AN/SLQ-32(V)2 is impacted most by delay time. Clearly replenishment support must be improved and a philosophy implemented to ensure that standard parts are used as much as possible in ESM design.

5.2 AVAILABILITY GUIDELINES FOR FUTURE ESM

The results in section 5.1 based on a review of the AN/WLR-1G and the AN/SLQ-32(V)2 indicate that achieving an MTBF of 500 hours and an MTTR of 0.5 hours may represent upper limits. These data are tabulated in Table 5-1 to show the effects upon availability.

TABLE 5 - 1

Probable Achieveable Ultimate ESM Availabilities

MTBF (hours) 250	MTTR (hours)	Availability 0.996	Difficulty modest
250	0.5	0.998	hard
500	1.0	0.998	hard
500	0.5	0.999	very hard

Design efforts to obtain these goals must consider the following:

- 1. Use of self-test features
- 2. Use of standard components based on a low failure rate technology
- 3. Implementation of redundancy
 - a. Adoption of techniques (for example: antennas) wherein performance "gracefully" degrades with component failure.
 - b. Separation of performance functions into several modes of operation wherein failure of one mode would still permit mission success in some acceptable degraded capability
- 4. Quality Assurance and Quality Control during the procurement and development stages
- Mechanical design to facilitate access and to minimize environmental effects

5.3 RECOMMENDATIONS

The following studies are proposed based upon conditions discovered during reliability analysis of the AN/WLR-1G and the AN/SLQ-32(V)2:

- Study of CASREPS to determine if supply line constraints are causing unnecessary down time.
- Study of the CV-3599 replacement for the CV-741 and CV-742 to determine its effect on AN/WLR-1G MTBF.
- Study of the feasibility of replacing the IP-480 and Power Supplies (PP 21560 and PP 2157D).
- 4. Study of the AS-899 Antenna drive train mechanization to determine what may be causing coupling failures.
- Study of the CV-1162A Tuner regulator to determine what may be causing abnormal high failure rate.

The studies are proposed in the order or priority. However, it has been indicated that data may be currently available that would minimize the extent of studies 2 and 3.

GLOSSARY OF ABBREVIATIONS

CDRL Contract Data Requirements List CFR Coarse Frequency Receiver CIC Combat Information Center DCU Digital Control Unit IFM Instantaneous Frequency Measuring (Receiver) MDT Mean Down Time MTBF Mean Time Before Failure MTTR Mean Time To Repair Mux Multiplexer Planned Maintenance Sub-system **PMS** RAC Reliability Analysis Center (Ref 6) RMA Reliability, Maintainability and Evaflability

Ship Repairable Assemblies

Casualty Report

MIL-HDBK Military Standardization Handbook

Mag Amp Magnetic Control Amplifier (AM-1017)

RF SW Radio Frequency Switch

RF SW Radio Frequency Swinch RV Resistor, Variable P/O-WLA-3B Part of AN/WLA-3B

CASREP

SRA

REFERENCES

- Technical Manual, Organizational and Intermediate Maintenance With Parts List, AN/SLQ-32(V) Countermeasures Set, Document No. 061290633, 1 September 1978.
- Maintainability Analysis And Prediction Report, CDRL NO. A00V, Raytheon Document No. 0612900626, 30 July 1978.
- DTPEW System Techeval RMEA Final Report, prepared by Columbia Research Corporation for NAVELEX PME 107 under Contract N00189-77-C-0207, 7 March 1977.
- 4. Reliability Prediction Report, CDRL A00N, Raytheon Document No. 061290625, 15 July 1978.
- 5. Handbook, MIL-HDBK-217B, Reliability Prediction of Electronic Equipment
- 6. Nonelectronic Parts Reliability Data, Published by Reliability Analysis Center, Order Number NPRD-1.
- 7. Mechanical Design and Systems Handbook , Harold Rothbart, McGraw Hill, 1965.

--APPENDICES TO REPORT
ON AVAILABILITY STUDY OF

THE WLR-1G AND SLQ-32(V)2 ESM SYSTEMS

CDRL A001

CONTRACT NO. N66001-78-C-0318

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APPENDIX A

3-M FIELD DATA WORKSHEETS

Appendix A is a reduction of the raw 3-M data to identify maintenance actions to units, assemblies and repair-time. The data is for WLR-1G receiver only and is arranged by year and ascending unit number. An asterisk (*) by the man-hours indicates time spent on several actions with that job sequence number. The "REF" column references the maintenance action. For actions taken where more than one replacement occurs, the reference number will be the same.

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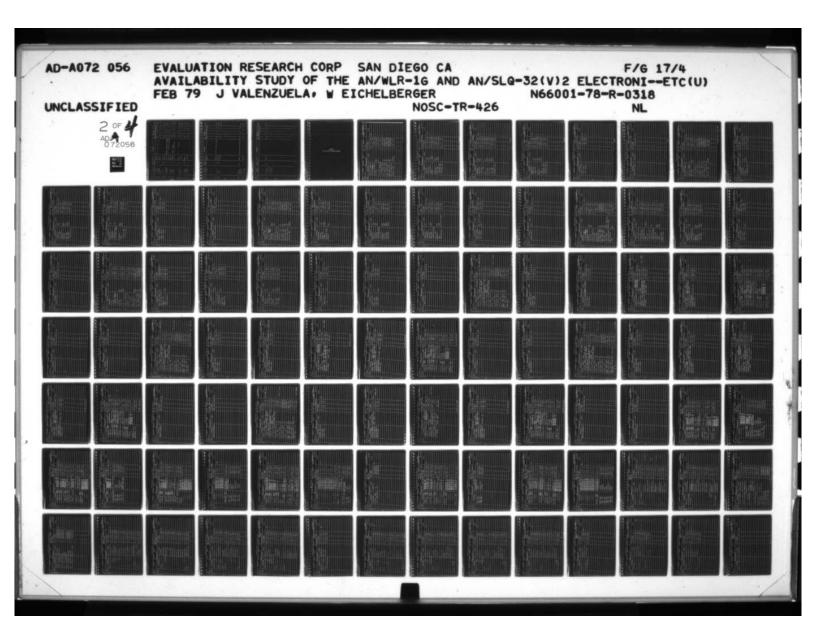
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Francis County Francis County	GROUP:	DEVICE IDENTIFICATION NUMBER	ALUMINUM												į
	SUBSYSTEM: EQUIPMENT:	DEVICE IDER ROMENCLATUNE	GEAR SHAFT, SPUR												
	STOTE	veda:					_ 2:	3 _							

INTERÈNT RELIABILITY ANALYSISMORKSHEETA

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	GATE 10/25/18	SUDASSEMBLY:	SHEET CE		REMARKS	82	-		11						3916.531	-		
		ASSEMBLY: A1	PRESELECTOR		ζĸ	01.	310.	17.0	3,3	o V		800	14000	L Y				
	"ORKS"	ASSER			RATEX	0),	810'	17.0	1.1			82						
	יאר YSIS	UNIT: 2	ON-133B	TITI-SELIO	Z	-	-	-	M									
	HERÈ	GROUP:		DEVICE IDENTIFICATION	NUMBER		CM	12263							•			
		SUDSYSTEM: EQUIPMENT:		DEVICE IDE	NGMENCLATUNE	CONDENSER	CAPACITOR	टाकान	CONTECTOR COAX.								The state of the s	
Samuel Summer	1.	SYSTEM	61-8-10	INDEX	. KUKBEN						25							

REMARKS SUZASSEMBLY: 200 = = = IF PREAMP. ASSEMBLY: A2 65,0 0901 haderen reliabilit and rsismorksheet 100 4. .054 65.0 から 145,741 XX. 00. FAILUNE RATE X 190. ,0077 . 44 32.5 32,5 .03 .47 = CN-7338 OUA:TITY N CITY OF N 24 25 4 N 4 1 4 4 4 NUMBER GROUP: 5654 5842 DEVICE IDENTIFICATION 0 RCR Sk 2 COUNTECTOR , COAX. HOMENCLATURE TUBE REC. TURE, REC. COIL, PRF CAPACITOR CAPACITOR SUBSYSTEM: RESISTOR RESISTAR VLR-16 FURBEA SYSTEM

	DATE 19/25/78	3	SHEET LCS		DEMARKS	Ns	- 1	J.		4	1	=	=		100	2003.636.90		CT SYSSESSION AND STATE OF THE	The state of the s
1	· · · • h	IBLY: A3	5		ζn.	4	<u>o</u> .	1,32	.032	.023	32,5	1,1	.89		D	*		A	
1	ANAL YSIS WORKS WET	ASSEMBLY:	3 D OSC		RATEX	44.	01'	.44	100.	7100'	32,5	1,1	66.	6.0 (0)					
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	hardeneini RELIMBILLIT	Gnoup:		ENTIFICATION	้ทบพอะค	ə ə		CK		RCR	5718					6305411	310-11-07-07		
		sucsystem: Equipment:		DEVICE IDENTIFICAT	NOMENCLATUNE	CAPACITOR	CANDT NOTER	CAPACITOR	CAPACITOR , PAPER	RESISTOR.	TUSE	CONNECTER, COAX	CANCITOR MICA						
1.	•	373724	21-8-10	MOEX	า.บะวยก														

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ASSEMBLY: A4- SUBASSEMBLY: REMARKS. 20 = = SERVO BRIVE ,236 52.0 ,236 INHERENT RELIABILITY ANALYSIS WORKS LEET XN. cerss .236 FAILUNE RATE À 55.0 .236 C2-7338 QUA:TITY N UNIT: NUMBER GROUP: DEVICE IDENTIFICATION motor, contract GEAR IDLFR GEAR, CLUTCH NO .: ENCLATUNE SUBSYSTEM: DLR-16 L'UNDEN SYSTEM

DATE 10/15/78	10	REMARKS	20										80 (C)		910000000000000000000000000000000000000	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
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ORKS, LE		FAILUNE	1.74		1.40.87	1000	100		0.00	6 2			200				
ANAL YSIS'	UNIT: 2 CU-7338	QUA:TITY	-							89		lo,	38.7		0 1		
ייייושאוי	: Gnoup:	TIFICATION NUMBER	0.75										204000	10 11 11 10 18		000000	The second second second second
	-1 CS COUPMENT: EQUIPMENT:	DEVICE IDENTIFICATION NOMENCLATURE	GEAR SHAFT, SPUR														
,	System:	Nacauci.						- 25									

SHEET A CH DATE 10/25/73 REMARKS 21100 - MTAR - 2171. SUBASSEMBLY: 2 -= = = : 22.0 から 132 400 21426 21426 145,764 145,764 25.8 55472 55.472 तंतं 37,537 .86 174 1 INHEREIN! RELIABILLI T ANAL YSIS WORKS LETT NEG. ASSEMBLY: FAILUNE ,066 26 37.537 +90. 22,0 1,74 -: م MENG. --CS-7348 QUATTITY N C. 3 4 4 4 M 2 UNIT: NUMBER GROUP: A8+A9 DEVICE IDENTIFICATION AA AN R 44 AP A3 Z EDU!PMENT: TRANSFORMER, P.S.R. ADAPTER, CORKIAL PACK * PICTER BANDARSS MAJ. TUNE BRIVE ASSY. ガンドさいること ASS7. SERVE DRIVE ASSY. ASSY. ASSY. ASS.Y ROMENCLATURE TH POSEANIP. PRESE LECTOR OSCILLATOR SUBSYSTEM: RESISTOR RECIETOR CONSTITUTOR. COUPLING クーとう MOEX. SYSTEM 30

REMARKS SUBASSEMBLY 23 = : : = PRESELECTOR ASSEMBLY: A1 17,0 ,0077 3,3 .94 .078 YN. 0 -IUPIU INHERENT RELIABILITY ANALYSIS WORKS LETT FAILURE 800. 12.0 7700. .42 0 -: CN-134B CUA:TITY N ... no 4 (1) NUMBER GROUP: 12263 3 DEVICE IDENTIFICATION 2 RCR EQUIPMENT: CAX. NOMENCLATURE CONDENSTR CATACITOR CONNECTOR SUBSYSTEM: CAPACITOR RESISTOR DIODE 8-18-3 CYSTEM 31

SHEET LOF DATE 10/25 12 REMARKS ASSEMBLY: A2 SUBASSEMBLY: 2 -= = : CV-734B | IF PREAMP. 65.0 65,0 0,= .47 2.7 ,054 99. X1. 00. 99. INHERENT RELIABILLY ANALYSISMORKSHEET FAIL UNE RATE X .0077 44. 190. 32,5 32,5 66. .47 .03 -,-QUATITY N Sum or mis 25 4 10 4 4 d UNIT: HUNDER GNOUP: 5847 5654 ROP DEVICE IDENTIFICATION R 3 DO 2 EQUIPMENT: CONSTETOR, CONX. NOMENCLATURE JON 100 TUBE, REC. TURE REC. CAPACITOR CAPACITOR RESISTOR CAPACITOR SUBSYSTEM RESISTOR 2-R-10 TOUR . 32

	NATE 10/25/78	١٢٪:	SHEET - 3E		REMARKS	Se	5		7	7	-		=				26	Contract DR		7,000	30 B (p 1 1 2 A)	
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	h. rsis	UNIT: 3	CV-7348	11.5.110	N	-	-	N	2	-	7	2	-	1								Cur oc una
Francia Francia Francia Francia	hartenen' RELIABILLI TANAL YSIS WORKS LIGHT	GROUP:		ITIFICATION	מחשפע	20		Çk	74			RCR	5718	20pf ±5%, 500vBCW				379345	110000000000000000000000000000000000000		84.5. 155.35%	
		SUBSYSTEM: EQUIPMENT:	WLR-16	DEVICE IDENTIFICAT	NOMENCLATURE	CAPACITOR.	CONDENSER	CAPACITOR	CAPACITOR	CONNECTOR CONX.	COIL RF	RESISTOR	TUBE	CAPACITOR MICH								
	-	SYSTEM	7	X30KI	RESUMPLY.							13										

SUCSTSIE	EQUIPMENT:	GROUP: UNIT:	M	ASSEM	ASSEMBLY: A4	SUBASSEMBLY:
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96	DEVICE IDENTIFICATION	NO				
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J - SARS	ASSE MAN	Y FAILURE	RATEX	1,74		0								
ANAL YSIS:	UNIT: 3	DUANTITY	Z	-					34					enu or u '
In HEREIN FRELIABILITY ANAL YSIS WORKS LETT	dent: GROUP:	DEVICE IDENTIFICATION	NUMBER	IST					2.8					
	- 1 &	DEVICE 10	NOMERCLATURE	SUAFT, CEAR	Charles Days to the State of th								Activities of their control of the c	
	SYSTEM:	X E COLLEGE						35						

SHEET - CF REMARKS DATE 10/2 210 SUBASSEMBLY いしていたい 2 --= = = = = = -= = = 22.0 132 4,6 .064 55,412 |55,472 25.8 212 209 .56 141,386 H1.386 74. 58.483 YN. 2,10 1.74 INHEREN' RELIABILLI ANALYSIS ... ORKSILET. 1.40 = 00. .472 ASSEMBLY: FAILURE 58,483 190. \$0. .56 22.0 2,10 .46 236 1.74 = 8.6 20. -06: CC-1358 QUA:TITY N UNIT: 4 4 M 4 M 4 4 ALUMINUM NUMBER ら形に GROUP: DEVICE IDENTIFICATION SPRINC 240+ 1887 RA R AC AY A4 マ EQUIPMENT: Child Pass PRESELECT - OSC. ASSY. ASSY. SWITCH SENSITIVE ASSY, PASEL SPRING, EXTENSION ASSY, NOMENCLATURE BANK NO TRAISTORMER SUITEN, PUSH GEAR , SPUR SERVO BRIVE SUBSYSTEM: IF PREAMP. CONVECTOR OSC. ARM. RESISTOR RESISTOR AND THE FILTER BACL GEAR 5-1017 LUMBER CYSTEM 36

SHEET A CE REMARKS SUBASSEMBLY DATE 200 : -: = = : : = 5 = = = = CN-735 BRESEL-050 ASSEMBLY: A1 1,32 132 264 .032 1,32 32.5 1000 KY. 2,0 44. ,015 01. 66. 1.74 170 = ,33 INHERENT RELIABILITY ANALYSISMORKSHEET FAILUNE .056 *44 17.0 990. 10000 190. 0.0 * 44 -: 32,5 .47 1.74 99. 01. 01. QUA:TITY N CHAIN OF ALTE. 4 4 4 4 M M n 4 NUMBER GROUP: 1263 JA DEVICE IDENTIFICATION 5675 RCR CK EQUIPMENT: GUSTICTOR, COAX. CAPACITOR, DAPER CARACITOR, MICA CANCITOR , VAR. CAPACITOR, CER. NOMENCLATURE BEARING , BALL CHOKE, RE CAPACITOR GEAR, SPUR CAPACITOR SUESYSTEM: PESISTOR COIL, RF CO16, RF DIODE 108日 クレアーしの FUTTOEX CYSTER 37

SHEET LC: REMARKS SUZASSEMBLY: 2 = = -CV-7350 IF MURAMM. ASSEMBLY: A2 65.0 65,0 7.48 4. XH. 2.2 .00 .046 160011 100 THEREN' RELIABILLY ANALYSIS WORKS LEET FAILUNE .0077 990. 4. . 42 32,5 32,5 = .03 COUNTITY N 20 2 4 4 0 4 4 4 0 UNIT: NUMBER GROUP: 2845 5654 DEVICE IDENTIFICATION い下 de RCR 3 CONNECTOR COAX NOMENCLATURE TUBE, REC. TUBE, REC. CAPACITOR GB1 , RF SUBSYSTEM: CAPACITOR RESISTOR RESISTOR カーととろう ייחי: פנייתי. SYSTEM: 38

SHEET L CE REMARKS SUBASSEMBLY: DATE 52 = = ASSEMBLY: A4 .236 SERVO DRIVE .236 55.0 cc, 22 ₹. INHERENT RELIABILITY ANNERS WORKS LEET FAILUNE RATE À 52,0 .236 .231 CN- 735b OUA:TITY N CHAIN DE 11 74. UNIT: NUMBER GROUP: 14SH DEVICE IDENTIFICATION EQUIPMENT: motor, construct GEAR, CLUTCH GEAR , IDUFIE HOMENCLATURE SUBSYSTE!:: ULR-18 . Undex 39

DEVICE IDENTIFICATION OUNT: A OUNT: A OUNT: A OUNT: A OUNT: A OUNT: A	S.B OSC. ARM SHEET	TY FAILURE "NA REMARKS	.70 2,10 13							
	GROUP:	NOI	M			0				

SHEET HOSE REMARKS SUBASSEMBLY DATE 250 : -= = = = -= = : = = 66,0 1064 ,132 .86 140,724 140,72C 23.608 23,608 0= و SIO. 4.4 197,54 X2. = 119 .46 89. Ξ 195 ASSEMBLY: INHERENI RELIABILLI ANAL YSIS NORKSILLET FAILURE 990. 197.54 400. 65.0 0: --SE 22.0 rroo. 7 89: 4. I 6:1 = = CV-1368 OUA:TITY N CITE OF 11 % 4 4 M 4 M UNIT: The same of NUMBER GROUP: DEVICE IDENTIFICATION RCR 082 A3 A2 AA 7. 4 AACK PARK RISISON PRECISION SUTCH, CLERITIVE IF IMPLIFIER ASSY, ASSY. ASSY. CONDITION, COAX. TRANSPORMER , PINS SWITCH TOGELF NOMENCLATUNE YSOA' YOU ON TUBE , RECT. TO LECTOR SUBSYSTEM: USC1-1,6Tox So Puta Gros CHINER OF RESISTOR PET ISTOR ABATTER. FICTER LAMA VLR-16 ייים בא SYSTEM

INHERENT RELIABILITY ANALYSIS ... ORKS ... ET

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-	9.	10	CN-1368	AS		SHEET Z
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SHEET - CF REMARKS SUZASSEMBLY: DATE Z = : = = = = PRESELT-CTOR ,0077 44 ASSEMBLY: A! 1.02 00100 1.24 17.0 2.2 X2. .70 hartenen reliability Analysis GRISSINET FAILUNE 17.0 1.02 1000. 1.74 .47 .70 = CV-7363 OUA:TITY N 4 4 NUMBER GAOUP: 12263 DEVICE IDENTIFICATION RCR C K CONNECTOR, COAX. GEAR, SECTUR BEARING, BALL KOMENCLATUNE BEAR SPUR SUCSYSTEM: C.PACITOR RESISTOR ALONS FE シーとろう Vac:an. 27.87.2.2 43

SHEET L 35 REMARKS SUDASSEMBLY: 23 = = = 7.82 ASSEMBLY: A2 AMP. .046 65.0 140.001 65.0 .94 .66 ¥. 00. Interent Reliable transcribenders 1:1 1F FAILURE 37,5 44. ,0077 200. 32,5 .47 .03 --CN-7368 QUA:TITY N 00 4 0 4 و 2 4 UNIT: NUMBER GROUP: 5842 5654 RCR DEVICE IDENTIFICATION MY S V 00 EQUIPMENT: COSSIGNOR CHOK NOMENCLATURE REC. TUBE, REC CABACITOS からいいから RESISTOR SUBSYSTE COIL, RF CAPACI TOP TUBE シーンス romex. 44

DATE 10/26/72	SUDASSEMBLY:	REMARKS	32		-					12.00		The second of the second	
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witeReini RELIMBILLI	GROUP:	NUMBER	לא		6BIMG * LYSTROM				0	2780)	HILOVEI CA		
	SUDSYSTEM:	DEVICE IDENTIFICATI	CKPK-11-10%	BEARING, BALL	TUPSE						ACT OF THE REST OF THE PERSON		
1 -	3,000	י גיינינים .					45						

SHEET LOF. REMARKS SUCASSEMBLY: DATE 200 = : -SERVO NEVE 55.00 ASSEMBLY: A4 .236 .236 5.22 INHERENT RELIGBIETT ANAL YSIS WORKS LEET XN. 10101 FAILUNE .236 55,0 .236 40,-CN-7360 OUA:TITY N M NUMBER GROUP: 145+ DEVICE IDENTIFICATION + N EQUIPMENT: MOTOR, CONTROL NO ... ENCLATURE SFAR, IDLER GEAR SHAFT GEAR, SPUR SUBSYSTEM: 12:2-19 Surgen Surgen SYSTEM

	DATE 10/26/78	SHEE		REMARKS	Ns									and the second of the	3-9,449.5		100000000000000000000000000000000000000		
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I I		SYTTEM:	ITIDEX	าเบลเลยก						47	0								

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SHEET TO SHE , NO PAR-APPROX. 100Km, 2 REMARKS トンいつ単名の SUBASSEMBLY: DATE 2 : --= = ٥ = -= = = = = .064 0.0 66.0 89. 89.0 30,412 30,412 59,132 59,132 32,341 32,341 48.871 48.871 .56 3.70 i.s 8.80 12,0 3 AFR. 3.48 INHEREIN' RELIABILLI TANAL YSIS WORKS LIEET ASSEMBLY: FAILURE 3,70 89,0 22.0 .56 1 1004 10.0 12,0 89. SEG. 8.80 1.74 CV-1159A 11.10.113 QUA:TITY 3 4 UNIT: $\widehat{\varepsilon_{\mathfrak{F}}}$ 5002 Rms SEC. 164 .354 RMS + 64 .24 RMS (ATY.) 220VAC 9 AMP. PRI. 1094-131V 47-63 HZ 137K +30/. 105V 60 K4 4 CONTACTS - 15A - 5A HUMBER 3W 137F GROUP: 16 CONTACTS 785 DEVICE IDENTIFICATION 2 Pos. M AZ AIO 35 44 AN AS B A Z PE X7 EQUIPMENT: PR.YELL MIME TENST FOR WITH Y DUR PERCISION 155X ASS7. ASS.Y. PRINCIPLY ASSY ASSY, , TOSSOLE ASSY. ASS:Y SOAX ASSY. NOMENCLATURE METER, ELAP. XXX TRAMEL というころ CONNECTOR DRIVE CAM SUBSYSTEM: SPUR RESISTOR ついただけいる CAM コンじつい C. アナナタ MIXER FRONT POWER PRESEL. GEAR, SEA R osc. U U の一とろう LUGEX. SY27E#: 48

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EN FELLHBILLIT	Gnour:																		.	
· haden	meur:	DENTIFICATION																		
		DEVICE II	ASSY	ING BALL	D CAVITY											05.8 81.9		STATES TO STATES		
-	R-16		ADAPT	BEAG	TUNE															
	hwhere	CV-1159A	R-16 EQUIPMENT DEVICE IDENT	R-16 BEVICE IDENT ROWERCLATURE ADAPTER ASSY, CAX,	R-16 BEARLUG BALL	R-16 R-16 ROWENCLATURE ADAPTER ASSY, COAX, TUNEE GOUIPMENT	R-16 BEARING BALL TUNEE CANITY	R-16 RAPTER ASSY, CAX, DEALL TUDED CAVITY	R-16 BEARING BALL TUNER CANITY TUNER CANITY TUNER CANITY	R-16 ROWENCLATURE ADAPTER ASSY, COAX, BEARING, BALL TUNEE CAVITY	R-16 ROWERCLATURE ROAPTER ASSY, COAX, BEARING, BALL TUNEE CANITY	REARING BALL TUNER CANITY BEARING BALL TUNER CANITY	R-16 ROWERCLATURE ADAPTER ASSY, CAX, BEARING, BALL TUNEE CAVITY	REARING BALL TUNER CANITY BEARING BALL TUNER CANITY	REARING BALL TUNEE CANITY BEARING BALL TUNEE CANITY	REARING BOUITHERST BENT BENT BENT BENT BENT BENT BENT BEN	ADAPTER ASSY, CAX, TUNEE CAULT	R-16 BEARING BALL TUNES CAN, CAN, TOWNER CANTER ASSY, CAN, TOWNER CANTTY	SUBSYSTEM: EQUIPMENT NOMENCLATUNE ADAPTER ASSY, CAAX, BEARING , BALL TUNED CAULTY	SUBSYSTEM: EQUIPMENT ROWICE IDENT NOMERICIATURE ASSY, CARY, CARY, TUNIED ANITY

SHEET LCS REMARKS ASSEMBLY: A 4 SUBASSEMBLY: 2 = = OSCILLATOR 27,412 1,40 3 X1. INHERENT RELIABILITY ANALYSIS WORKS WET 27.412 RATEX .40 500 CV-1159A OUA:TITY N 7 4 UNIT: 12,3 VDC NULBER GROUP: OSCILLATOR, MICRONANE TEXSCAD DEVICE IDENTIFICATION EQUIPMENT: BUSHING, BEARING BEAGING BALL NOMENCLATURE SUBSYSTEM: 01-873 THOEX. SYSTEM 50

	DATE 106.2178	SUZASSEMBLY:	SUPPLY SHEET LCF	NA REMARKS	099	-	6.0 " 200V & AMP	-	.206 "	: a						A Properties and the second se		1.7
U ₁	OBKS1.eET.	ASSEMBLY	POWER	FAILUNE	.033 .0	.0132 .0.	,75 b.	13.0 2		010. 8400,								20.24
Promotes Comments	ANAL YSIS'	UNIT: 6	CV-1159A	4) QUACTITY	(A)	2	8	2 2	3 2	7								
B B	harterein' RELIABILLI' ANAL'YSIS' JRKSILET	INT: GROUP:		6	CLR CLR25BH25IT6PU	CKROLBX103KP	133189	RJ MI-R-22297 RJSO	TUNT 404, OUTPUT 5-404	EPOX7 GLASS		73 20 10 17 18 11 16 16 16 16 16 16 16 16 16 16 16 16			10 TA 94 TO			
		SUDSYSTEM: EQUIPMENT:		NOMERCLATUNE	CAPACITOR, ELECTRO.	CAPACITOR	COLLS, FROM	RESISTOR, VAR.	REGULATOR, DC VOLT	P.C. BOARD					31 111/38			
		. ASTER:		UKBEN							51	*						

INHERENT RELIABILITY ANAL PSISTAGET.

×	DLR-16		e	ASSEMBLY: A 6	SUZASSEMBLY:
OEX			CV-1159A	BENR DRIVE	SHEET
	DEVICE 1DE	DEVICE IDENTIFICATION			
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			INHER	iwHERENT RELIABILI		T ANAL YSIS WORKSINEET	. IS' well	3KS114E	· · · ·	DATE 10/26/78
SYSTEM:	SUBSYSTEM:	EQUIPMENT:	EHT:	GROUP:		UNIT: (0	ASSEM	ASSEMBLY: A7	SUDASSEMBLY:
81-R-16	91-					1-23	CV-1159 A	PREAMP.	IMP.	SHEET TO CE.
190EX		DEVICE ID	DEVICE IDENTIFICATION	13		0119	1	911110		
Kumasa	HOMENCLATI	Ē		เขาเลย	in (ary)		N	RATEX	ζN.	REMARKS
	CAPACITOR , L	CLASS VKR.	A 7 COC1	10.0 PF	H	(3) 5		2.7	13.50	NS
	Chraci Tor		CKLOA	103	(4)	0		4	3,96	2
	CAPACITOR,C	FIXER	FEED THRU SOOV DC	RO 470 MMF) %077 }	₹. 4		44,	1.76	
	CAPACITOR, Y	MICA	cwo cwo	50	M	3 4		810.	.312	1
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	CAPILITOR FIXE	FIXED, CER.	DIELECS 470 mmf	\$74250FF \$120% 50		7 1	7	44	3.08	, ,
_ 5	CONNECTOR ,C	COAX.	UG-477/U		ve-535/v		7	1,1	2,2	· ·
3	13 J		CERAMIC	1 SLUG	TUNE.	4	-	190	.264	
	CHOKE, RF MG	Modera	150mh	۹. (4)	(z) Y~89.	7		1900	.462	N
	TRANSISTOR, G	PANT OFF.	2N2997	26.		3		3,5	5'01	1
	TRANSISTOR, &	818 618,	222996	96		3		3,5	10,5	II.
	RESISTOR		RC076F472	=472K	(10) (5) R	Rc. 21		039	818.	0
			RC 076	F 222K	(E) (1)		(-	1	I_1
	REASTORNER ASS	ASSY,				3		990	861.	n .
	RESOUNTOR, LEE	THETICAL				.	_	1990	990.	1
		Separate Control of	A separate property of the second	Congress (Congress of the	A Charles Server			Secretarios de Ray	10001	

REMARKS SUCASSEMBLY: Sa RESIEL CAM ASSEMBLY: A10 08'8 3 000 INHERENT RELIABILITY ANALYSIS WORKSHEET FAIL UNE RATE À .40 CV-1159A QUA:TITY N 44 UNIT: C GROUP: DEVICE IDENTIFICATION EQUIPMENT: BUSHING, ECCTUTRIC NOMENCLATURE SUBSYSTEM の一とうろ LUNESEA CONTRACTOR SYSTEM: 54

1	DATE 10/12/19	1,4:	SHEET _ CE		NEMARKS	28		•	Contract of the second				S. Constitution of the second					
	, L	ASSEMBLY: A11	. GAM		ζn.	12.0	353-8-82	7								T T LOCAL DE		0.01
	, GRKS. LEE	ASSEL		1	RATEX	4.		18				10			1000			
Const Const	NAL YSIS	UNIT: 6	CV-1159A	0110	N	30										•		COM OF W.N.
Training possess from the proof	INHEREN ' RELIABILLY ANALYSIS WORKS WET	EQUIPMENT: GROUP:	410	DEVICE IDENTIFICATION	หบพอะค	J												
		SUDSYSTEM:		DEVICE	NOMENCLATUNE	BUSH ING, ECCENTRIC								A DESCRIPTION OF THE PERSON OF				
1	- j	CYSTEM.	ローピラ		ייטייטביי.					. 12	55							

SUBASSEMBLY: SHEET		REMARKS	APPROX. 100Ks.		.,		•		av-	ONE UNIT, NO PKE				07 - 40	÷2,			
SUBAS			2	:	=	-	=	=	٤	1	4		11	=	ı	11	=	=
ASSEMBLY:		ζn.	1.8	32.	10.0	66.0	89.	100.	3.70	89.0	30.412	32,341	58,132	48.871	NE C.	12.8	12.0	3,48
7 ASSE	_	RATEN	2,	,56	10,0	22,0	89.	,064	3,70	89,0	30,412	32,341	59,132	48.871	NEG.	1218	12.0	1.71
U. 1 - 7 O		UDA:TITY N	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	0
GNOUP:	HIFICATION	หบเลยเล	RD.	16 CONTACTS -15A SOON	32 115	SW 137K +3% 105V (1) RV4LAYSA252A (2)	λ.	PRI. 1094-17	42	A B	44	AS	A6	47	A8 .	Alo	AII	
TLM: SUBSYSTEM: EQUIPMENT:	DEVICE IDENTIF	номенскатипё	ATTA. COAX.	CONVECTOR PRIVE	METER, EIAP. TIME	RESISTOR PRECISION	SUTTON, HOLIUS	TENSORMER, PUR.	RESELFCTOR ASSY	MINERY ASSIV.	DESCRIPTION ASSY.	POWER SUPPLY ASSY.	GEAR DRIVE ASSY,	PREAMP, ASSY.	FRONT PANEL ASSY.	PRESEL. CAM ASSY.	OSC. CAM HSSY.	CEAR SPUR
0	1	r.บ.:วะก														- 04		

DEVICE IDENTIFICATION NUMBER NOTE IS THE STATE OF THE S
10.3 M 10.3 M 10 - 102 M 10 - 102

	DATE 10/26/17	Cuert Cuert	1	REMARKS	2	2	200V 2 AMP.					•	•	86	900 1 000				
	1	1	EK SUMPLY	ΥN	660.	4	6.0	26,0 "	.206.	, 010,									
	Accessor V.	T	TOWER TO	FAILUNE		.0132	sr.	13.0	.103	.0048							3 P 3	3	
	Ukil: 2		K0911-77	QUA:TITY	M	2	00	2	2 2	4									
hordenew (Reliability)	GROUP:			UEVICE IDENTIFICATION "UMBER (QTY)	CLR CLR25BH155176F()	CKR CKROGENIO3KP		5 0	TUNT 40V, 00TPUT 5-40V	EPOXY CLASS						0.50000		45. 546	
	SUDSYSTEM: EQUIPMENT:	91		NOMENCLATUNÉ	CAPACITOR, ELECTRO.	CAPACITOR	DIODE , SILICA	RESISTOR, VAR.	REGULATOR, DC VOLT.	P.C. BOARD									
	3737500	1-X13		. וויספא גינייספת															

SYSTEM:	SUBSYSTEM: EQUIP	EQUIPMENT:	GROUP:	UNIT:	7	ASSEMBLY:	. 4	Subassemmi V.	
121R-16	16			22	CV-1160 A	GEAR D	BRIVE		SHEET
THOEX	DEVICE	DEVICE IDENTIFICATION	2			-	1		
Lumben	HOMENCLATUNE		number	3	N RA	RATEN	KN.	NEMARKS	AKS
	MOTOR, SERVO	2 PH.	115 VAC 60HE 1	1	13	55.0 5	55.0	200	
	SWITCH SENSITIVE		4 29 2°	à	=	-	=	=	
	GEAR, BENEL, MAION				2 .236	-	42	=	
	CENCHEAD, PRECISION	5 27=1	PARTIO SST		1.86	-	78'1	=	
	BEARING, BALL			Ī	.10	01,0	0	=	
					111				
			4.55				13		
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	in the second								
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L	DATE 10/11/18	SUBASSEMBLY:	The same		BEMARKS	Ns	13	=	L L	\\ \tag{2}	, (u	11	:	-	II.	5	4	-	1	
I,	ET	ASSEMBLY: A7	PREAMP.	L	ζij	13,50	3,96	1.76	,312	1.25	3.08	2,2	.264	.462	5,01	10,5	819		.198	190.	48.871
NAME OF THE OWNER	ANAL YSIS WORKS LEET	ASSE	-		RATEX	2.7	4	.44	\$10.	.250	4.	1.1	1900	190'	3.5	3,5	.039		990.	9901	skn =
11	AL YSIS	UNIT: 7	RO911-NO	J. V. I.O	Y. I. I. V	5	6	4	4	Ŋ	1	Ч	4	1	3	ε	21	1	3		Sum of
	haderen' RELIABILLITA	GROUP:		DEVICE ICENTIFICATION	ווטווום בו (פדא)	7	0 7 8	FEEDTHRU ATOMING ±17		5000 DC 2.2 mmf (1)	ATOMAF #10% SOONE	UG-417/U UG-535/U	CERAMIC SLUG TUNES	(2) 4m89. (4) 4m22.	2N2997	222996	RC078F 137K (5) RC	,,,			
Control Country Country Country Country Country		SUDSYSTEM: EQUIPMENT:	91-	DEVICE IS	KOMENCLATUNĖ	CAPACITOR , VAR.	CAPACITOR	CAPACITOR, CERAINIC	CAPACITOR , MICA	CAPACITOR, CASS	CAPILITISE FILED, CER.	CONNECTOR , COAX.	Coll RF	CHOKE, RF MODES	TRANSISTOR, GER.	TRANSISTOR, GAR.	RESISTOR		RENSTORNER ASSY.	RESONATOR, LEUCAL	0
1	· .	37.2.2.E.	218-16	110EX	7.Umben						61										

SHEET 1. CF		REMARKS						X.							77.75	100	-
SUZASSEMBLY: SHEET		REM	52				1 2					8,00					
ASSEMBLY: A 10		ŲΝ.	12.80			16			160		10				9000000		
ASSE!		RATE X	.40														
UNIT: 7		OUA:TITY N	32	***													
IT: GROUP: ASSEMBLY CU-1160A PRESE	NOI.	NUMBER			0.00						The first county of the first o			ALCOHOLD TO			
EQUIPMENT:	DEVICE IDENTIFICATION	ηĒ	FCCENTEI C							AND LOS			17.00				
SUDSYSTEM:		NOMENCLATUNE	BUSHING FCC									A 6 7 10 A 8 7 10	95-11/00/2019				
SYSTEM: NALP:-1G	INGEX	หับพวยท															

	126/28	-	SHEET CF		HEMANKS		•	 A 22.										10000000000000000000000000000000000000		
	DATE	SUCASSEMBLY:				24								444						
		ASSEMBLY: A 11	. CAM		NA.	12.0	L d & Try WO		100		Na.		100	19				NU AND	132	
	יסאונאייקנ		osc.		RATEX	.40				2000	4						414		2000 Sec. 10	
	VAL YSIS'	UNIT: 7	CN-1160A	OUA:TILY	Z	30												•		
	INHEREN' RELIABILLY ANALYSIS WORKS LETT	GROUP:		DEVICE IDENTIFICATION	กบเล		2.	7.0												
		SUGSYSTEM: EQUIPMENT:	9	DEVICE IDEN	1:0.EUCLATUNE	BUSHING, ECCENTRIC	TO SELECT THE SELECT T		K-100 - 100		T (c)				ACCOUNT OF THE PARTY OF THE PAR	SELECTIVE SERVICES	101710		TO THE TOTAL PROPERTY OF THE PARTY OF THE PA	
1	- - - 1	SYSTEM	といろ	INGEX	. เกระจะก															

\$Y\$7.2.	suesystem: Equip	EQUIPMENT: GROUP:	URIT:	 M	ASSE	ASSEMBLY:	SUDASSEMBLY:
W18-18	9)		3	RV-1161A	4		T 13388
MOEX	DEVICE IC	DEVICE IDENTIFICATION		O. 18-71	_		
นะระล	NOMENCLATUNE	, nomber ((am.)	N	RATEX	Υ Ν.	REMARKS
	ATTA. COAX.	Re		-	51	1.5	NS AMPROX. 100K.D.
	CONNECTOR PRIVE	16 CONTACTS -15A	Sans	_	,56	.56	
	METER, ELAP. TIME	30 115	al	-	10,0	10,0	2
	RESISTOR PRECISION	34 137K +3%	(a) V201	3	22.0	66.0	
	SUITCH , TOGGLE			-	89.	89.	, 2
	TO GOS FORMER, DUR.	FRI. 1094-131V SEC. 164 ,35ARMS +	47-63 HZ 64 .24 RMS	-	,064	+90.	
	RESURCTOR ASSY	AZ			3.10	3,70	
	MINER ASY.	A3			89.0	89.0	" ONE UNIT, NO PER
	OSCULATOR ASSY,	AA			5.21	5.21	
	POWER SUPPLY ASSY,	AS		-	30,436	30,436	ı,
	GEAR DRIVE ASSY,	\$ P		-	59,132	59,132	11
-	PREAMP, ASSY.	A7			48.871	48.871	-
	FRONT PANEL ASSY.	, A8			NEC.	NEG.	tl.
0	PRESEL. CAM ASSY.	Alo		-	14,0	14.0	- 1 Sept.
0	OSC. CAM ASSY.	AII		-	11.60	11.60	h
_	CAPACITOR, ELECTRO	locomf 500	CO	-	1,9	1,9	11
7	CHAS CAST			,	174	2 10	o. 0000

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	DATE 10/26/75	-	Table 1	0000	HEIGARIA	λs		И							The same of the sa	tenerational A		
Bi'	, E	ASSEMBLY: A 2	PRESELECTOR	4	٧٧	2,2	1,4	10				4				3		000
	, GRKSE	ASSEM			RATEX	1,1	100	110										Ī.
01	NAL YSIS'	UNIT: S	CN-1161A	CHITIAND	Z	4	Ч	-								•		
	INHEREINT RELIGIELT ANDE YSIS WORKSINET	EQUIPMENT: GROUP:		DEVICE IDENTIFICATION	ัสบผลธล	, coax.							State 0.8118.0.0.8119	0.522440				
		SUBSYSTEM: EQU	. 91.	DEVICE	NOMENCLATUNE	ABAPTER ASSY, C	BEARING, BALL	TUNES CALITY								8		
101	- 	SYSTEM:	1573	INDEX	יייטייים פייי					65								

SHEET L CF REMARKS. SUBASSEMBLY: 200 = = OSCILLA-TOR ASSEMBLY: A4 2,10 1,40 1,60 ¥. INMERENT RELIABILITY ANDLYSIS WORKS LET FAILUNE 2,10 4 000 CN-1141A QUA:TITY N 4 4 (RCA) 12.3VBC CLR25BH180TGP 54767 15mm S4764 NUNDER GROUP: DEVICE IDENTIFICATION OSCILLATOR, MICROWAVE CAPACITOR , ELECTRO. BUSHING, BEARING FIXED NOMENCLATURE BEARING, BALL SUBSYSTEM: 51-877 LUNGEX LUNGER SY316.1. 66

SHEET LOS AMA 74 REMARKS 2007 SUBASSEMBLY DATE いつ = = : = = = POLER SUPPLY ,024 ASSEMBLY: A 5 26.0 .099 3,0 204 XZ. 8+8 20 101 = INHERENT RELIABILITY ANAL PSISMORKS MET ,0048 FAILURE 10132 .033 .103 .75 13.0 = CV-1161A QUATITY N 4 4 4 3 d CLR 25 BH 13176P (1)
CLR 25 BH 18076P (2)
CKRO6 BX103KP RJ50 TUBUT AND OUTENT 5-40V 70-3 2N3584 5K #20% MIL-R-22097 NUNBER DISS. GLASS GROUP: 123189 4 W PUR. MIL TYPE 350 DEVICE IDENTIFICATION LYOK L CKR CLR 2 EQUIPMENT: TRANSISTOR NOW THE CAPACITOR, ELECTRO. REGULATOR, DC VOLTS RESISTOR , VAR. CODIS, EDONE NOMENCLATUNE BOA RE SUBSYSTEM: CAPACITOR P.C. 21-8-10 INDEX. SYSTEM 67

TWITER BIN I RELIMBILITY AWALYSIS WORKS LIET

0 2 0 3 9 5	SULSYSTEM: ECUIPMENT: GROUP: BONICE IDENTIFICATION ROMENCLATUNE ROMENCLATUNE ROMENCLATUNE ROMENCLATION SAND 2.54 CON SANTCH, SEASITIVE MONN, ACTION CEARLEAD, PRECISION OFAR, BENEL, PINION OFAR, BENEL, PINION	DER C + AMP.	CV - 1161 A CV - 1161 A OUNATITITY FAIL 1. 25 1. 25 1. 35	A GEAR DO 1,1 1,1 1,8 1,8 1,8 1,9	SS. 0 -1-1 -401-1 -1-1 -1-1 -1-1 -1-1 -1-1 -1-1 -1	SUZASSEMBLY: SHEET L. III
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	SUBASSEMBLY: SHEET L.C.	REMARKS	NS	2		-	ا د ک	-	٤	11	4	-	1.	5	1,	11	=		
Tipe of the state	ASSEMBLY: A7	ζn.	13,50	3,96	1.76	.312	1,25	3.08	2,2	.264	.462	10.5	10,5	918.		861.	.066		18.871
	-1161A PRE	FAILUNE RATE A	2.7	4	. 44	800.	,250	4	1,1	1900	1900	3.5	3,5	.039		990.	9901		2 223
NAL YSIS	WHIT: 8	QUA:TITY	5	0	₹. 4	4	\$ C	7	4	4	7	2	8	7.1	-	3	-	120	SUM OF
harterent Reliability Analysistet	GNOUP:	ENTIFICATION NUMBER (GTY)	1 7	CKLOAWIOZW (9)	FEEDTHRU 470AME ±200	CMOSC	5000 DC 2.2 mm (1)	410 mmf ±10% SOOVE	UG-417/U UG-535/U	CERAMIC SLUG TUNE	150mh (4) .68mh (2)	2N2997	222996	RE078F 137K (5) RC	RC 076F 562K (1)(1) RC 076F 322K (3)				
	STELL: EUGSYSTEM: EQUIPMENT:	DEVICE IDENTIFICAT DER ROMENCLATURE	CAPACITOR , LAR.	CAPACI TOR.	CAPACITOR, CERAMIC	CAPACITOR, MICA	CAPACITOR, CLASS	CAPILITICE FIXED, CER.	CONNECTOR , COAX.	COIL RF	CHOKE, RF MOLDIES	TRANSISTOR, GER.	TRANSISTOR, GER.	RESISTOR		TRAISFORMER ASSY,	RESONATOR, LELICAL		
	3	rumbex rumber				,		69											

SHEET _ CF ASSEMBLY: A 10 SUBASSEMBLY: REMARKS 2 PRESTIL. CAM 4,8 ¥. INHERENT RELIABILITY ANALYSIS WORKSHETT FALLUNE ,40 RV-1161A QUA:TITY N 35 UNIT: NUMBER GROUP: DEVICE IDENTIFICATION EQUIPMENT: BUSHING, ECCENTRIC NOMENCLATURE SUBSYSTEM: クーとろう . LUDEX SYSTEM 70

	DATE 10 126 178	SUBASSEMBL		REMARKS	28						200 P 100 PH 100	8	18			
Bi'	+1	1~	4	ζu.	11,60											
	, v, JRKS, i eE		+	RATEX	40											
	NAL YSIS	UNIT: 8		QUA:TITY	29		-							•		
	INHERENT RELIABILITY ANALYSIS WORKS WET	Gnoup:	NO	NUMBER								636000				
BI	INHER	ENT:	DEVICE IDENTIFICATIO							19						
		SUBSYSTEM: EQUIPMENT:	A CONTRACT OF THE PERSON OF TH	NOMENCLATUNE	BUSHING, ECCENTRIC		100000	38/29				25.077/38/51/02	0			
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SUBASSEMBLY: 'SHEET		hemanas	NS APPROX. 103Ks. ;		=	-	1	-		" ONE UN'T NO PKY	-	-	1		-	=	The state of the s	1	" MTBF = 2882 HR
ASSEMBLY:		ξ <u>.</u>	1,5	38.	10,0	66.0	89.	.064	3,10	89.0	5.61	30.436	58,132	18.811	NEG.	14.40	11,60	1.9	3.48
		RATEX	1,5	.56	10,0	22.0	89.	,064	3.70	84.0	19.5	30,436	59,132 59,132	48.871	NEG.	14.40	11.60	1.9	1.24
CN-1162A	1	N N	-	-	-	3	-	+	-	-	1	1		-	•	-	-	1	7
2000	DEVICE IDENTIFICATION	ห่อนขอ	RD.	16 CONTACTS - 15A 500 V	3 115 60 H	34 1378 +3% 1057 (1) R441AYSA252A (2)	VAC 9 Am	7	A2_	A3	44		→	47	A8 .	A10	All	1000mb 501	
W-R-16		"AUX BEA NOMENCLATURE	ATTN. COAX.	CONNECTOR PRIVELY	METER , ELAP. TIME	KESISTOR PRECISION	SUITCH, TOGGLE	TELOS FORMER, DUR	PRESELFICTOR ASSY	MYER ASSY.	OSCULATOR ASSY.	POWER SUFFLY ASSY.	GEAR DRIVE ASSY,	PREAMP, ASSY.	FRONT PANEL ASSY.	PRESEL. CAM ASSY.	OSC. CAM ASSY.	CAPACITOR, ELECTRO.	GEAR, SPUR

	, , , , , , , , , , , , , , , , , , ,	SUBASSEMBLY:			REMARKS	82	7.							1 2/8						
U		ASSEMBLY: AO	PRESELECTOR		Υ Ν.	2.2	1,4	01.			Service Control	0.0	0.53							
0	, worksin	ASSE] 3	RATEX	1,1	.70	.10									× . 08			
	NAL YSIS	UNIT: 9	CN-1162A	OHAPITA	N	, q	4	-								market -		8		
	hudeneini Retidalli r' ANAL YSIS WORKS INCET	GRO''P:		IIFICATION	NUMBER											AS POWER TOTAL		To though	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
		SUBSYSTEM: EQUIPMENT:	91	DEVICE IDENTIFICATIO	NOMENCLATUNE	ADAPTER ASSY, COAX.	UTAKING , BALL	TUNES CAVITY							00013	A CONTRACTOR AND A CONT				
	-	SYSTEM.	ALR-	. MOEX	NUX:9E N					73										

INTERENT RELIABILITY AND YSIST ORKSINET

L R - NOEX NUMBER	1 & DE		A STATE OF THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.				
	OC.		J	CN - 1162 A		BCILLATOR	T T SHEET
-		DEVICE IDENTIFICATION	2	OH IN THE			
0.0	HOMENCLATUNE		NUMBER	N	RATEX	Υ Ν.	. REMARKS
	CAPACITOR , ELECTRO	. CL	R25BH180TCP	-	=-	1.	Ns
	OSCILLATOR, MICROLANE	- 01.7 JSmv	11.20 GH4 12.3VBC	-	2,10	2,10	1. TEXSCAN CAR
	BUSHING, BEARING			S	.40	2.0	
	BEARING , BALL			d	.70	1,40	-
					0	5	
						5	
		TEACH TO BE A SECOND					9.0
					A		
	-0.000	STORY UBS		•			
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							The second second

	CATE 10/26/17	1.4:	-1 1111111	and the second s	REMARKS	u		" 2001 / Amp								686.4880			N 1 4 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	
		AS CUB	SURPLY	-		2	\\ \frac{4}{z}		a	.0	£								_	و
	LET	ASSERBLY: A	POWER S	-	Υ <u>μ</u>	980.	420.	3,0	26.0	,206	1-1	.0048						No. of	X	30.436
	ANAL YSIC JRKSET	ASS		1	RATEX	.033	10132	.75	13,0		1.1	,0048	283					8		2/12
	Pr. KSIC	C:417: 9	CN-1162A	11.8.10	N	ह इ	7	4	4	Ч	-	-		V						SUM OF
	hartenen (RELIADILLI)	GROUP:		NTIFICATION	สบนอยล	CLR CLR 25 BH 18076P	CKR CKROGBXIO3KP			TWENT LOW, OUTENT 5-40V	MI TYPE 2N3584	EPOXY GLASS								
		SUCCEST: EQUIPMENT:	ф	DEVICE IDENTIFIC	1 J LOMERCLATURE	CAPACITOR, ELECTED.	CAPACITOR.	DODE , SILIGO	RESISTOR , VAR.	RESULTOR, DC VOLTS	TRAISISTOR NOW THE	P.C. BOARD					The control of the co			
1		2,4,2,2,12	3	X TOTAL	11.07.05.0															
	•										75									

Independ Religible ANAL (SISTINGELT)

		בתסוניייבינו:	UNIT: 9	ASSEM	ASSEMBLY: A !	SUBASSEMBLY:
01-K-10	91-		CV-1160 A		2 1	1388
xag	DEVICE IDE	DEVICE IDENTIFICATION		7		
ระก.	HOMENCLATUNE	นบแอะค	QUA:TITY N	FAILUNE	ζn.	REMARKS
	MATOR, SERVO	34000 2.54 COUT 000-	1	55.0	8	
	SWITCH SENSITIVE	128 V		-	2,55	8 =
	GEAR, BEVEL, PINION		14	.236	.472	=
1	GEARNEAD, PRECISION	27= RATIO SST	-	1.86	186	1-
	BEARING, BALL		-	00	100	2
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	ET · ·	ASSEMBLY: A 7	PREAMP.	_	Υ π.	13,50	3,96	1,76	,312	1,25	3,08	2.2	424.	.462	10,5	10,5	.819		861.	190.	F.3.	48.871
B	, voakka	ASSI			RATEX	2.7	‡	,44	800.	.250	4	1.1	1000	1900	3.5	3.5	.039	1	990.	9901	184118	र्रात न०
	ih. rsis	אוזו: פ	CN-1162A	OHA-TE:	N	7	0	4	4	N	1	7	4	7	4	n	74	1	3		17	Sum
	hartereini Retidoleti r Anal Ksis works. Let	GNOUP:		нтіғісатіой	ווטווםבת (מדא)	1,0 - 10.0 PF 1000000 JWHE (5)	01340	FEEDTHRU 470 MMG = 120%.	CMOSCIOOKO3 (3)	5000 DC 2:24mf (1)	TANDOFF	17/0	3	(2) Habo. (4) Habor. (2)	2N2997	222996	RC078F 472K (10)	RC076F 562K (1) RC076F 222K (3) RC076F 470K (3)				
		II. SUDSYSTEM: EDUIPMENT:	WLR-16	DEVICE IDENTIFICA	ROMENCLATI	CAPACITOR , VAR.	CAPACITOR	CAPACITOR, CERAINIC	CAPACITOR, MICA	CAPACITOR, GIASS	CAPICITOR FIXED, CER.	CONNECTOR JOOAX.	Soll, 18F	CHOKE, RF MOLDIES	TRANSISTOR, GER.	OFIR.	RESISTOR		TRANSTANER ASSY,	RESONATOR, LELICAL		
	-j.	SYSTEM	3	X3011"	e de la companya de l				,		77											

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, GRKS, LET		FAILURE	4.							00		Section 12 to 12 t		
NAL YSIS	UNIT: 9 CN-1162A	מזיקום) א	29	-						9				
INHERENT RELIMBILLIT ANALYSIST WORKS LEET	T: Gnove:	TEICATION NUMBER										16)		
	CUDSYSTEM:	DEVICE IDENTIFICATION NOMENCLATURE	BUSHING, ECCENTRIC				Shows as a second	10 M2 12 M2	W TO THE STATE OF					
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SUBASSEMBLY: SHEET CE		REMARKS																		
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ASSEMBLY:		Υ υ.	176	6,93	6,6	080	.75	1,50	1,12	!	2,2	1,6	132	.528	1	.132	177		1	+
-	1	RATEX	44.	66.	4.	210.	.75	.75	.56		11	7:1	190.	990.	1	.016	1100.	1	1	+
UNIT: 10 EV-741 FREG. CONV.		N N	4	2	S	n	_	9	4	1	7	_	7	8	1	14	23	1	-	
EQUIPMENT: GROUP:	DEVICE IDENTIFICATION	HUMBER (QT7)	CC30U 3750 3 (2)	1000pf +20%, 500VDC(4)	OAWIOZM (142 12458	GAN 18251	16 COUNT. 400 VAC 5A 3(1)	15 COUT. 490 LDC SA (1)	UG-1094/U	4PDT, 2802 27,51BC	STEATITE FORM WAST, CORE	MS 75008-33 (2) MS 75008-41 (2) WS 75008-37 (1)	89-36	,25 wh 0.05 1.5 A	RCR 208271KM (2) RCR 208332KM (2) RCR 2081045M (2)	RCR 206 170 51m (2) RCR 206 103 51m (1) RCR 206 121 Km (1)	RCR 206 412 5W (!) RCR 206 123 5W (!) RCR 206 152 KW (!)	
-1 C		NOMENCLATU	CAPACITOR, CERM.	CAPACITOR, MICA	CAPACITOR, CERM.	CAPACITOR, PAPER	DIODE SILICON	MODE SILICON	CONNECTOR RACK &		CONNECTOR , COAK,	RELAY GES. PUR.	COIL, RF	CHOKE, RF , MOLDED		CHOKE, RF	RESISTOR, COMP.			
2013	X30MI.	ROKOER						80								9				

	DATE 10/27 172	SUBASSEMBLY: SHEET 2 :=		REMARKS	82	-		0	L)	•	=	n	E .	1.	4	t ₁	1.		
I ₁	, Ta	ASSEMBLY:		Υ α.	1	!	!	7.	16,0	132	.064	65.0	32,5	32.5	32,5	403.822	332,780		
	T ANAL YSIS WORKSHEET	4-1 ASSE	_	RATEX		1	1	.03	22.0	790.	.064	32,5	32,5	32.5	32.5	403.822	332,780		
П	A. 1815	FREG. CON.	OHATHT.			!	1	4	3	7	-	4	,	1	-		-		
	INHEREN 'RELIABILLY A	G n O U P:	HTIFICATION		RCR 20G 154 KM (!) RCR 20G 183 KM (!) RCR 20G 101 KM (3)	RCR 20 6 102 Km (1) RCR 20 6 222 Km (1) RCR 20 G 224 5m (1)	RCR 20 6 105 km (1)	RA65B4813F (1) RA65B3480F (1) RA76B5112F (1)	RV4MAYSDS02A (!) RV4MAYSD 102.A (!) RV4LAYSA2528 (!)	MHZ IN	N . 0	5654	5670	6AH6WA	S687 WA	41	A2.		
		SUBSYSTEM: EQUIPMENT:	DEVICE IDENTIFICAT	HOMENCLATURE				RESISTOR , FILM	RESISTOR,	TRANSFORMER, IF	TRANSFORMER, PUR.	TURE, REC.	TUBE REC.	TUBE REC.	TUBE REC.	IF AMP. ASSY.	OSCILLATOR - MINER		
I	- ;·	3757EM:	I INDEX	บริธาณ์.							81								

SHEET LCF 10/27/18 REMARKS SUBASSEMBLY: DATE 2 : = 5 = = = = = -= : -= = 5 12,32 AMA ASSEMBLY: AI ,078 5,28 17,82 1.254 132 3 132 N.A 44 396 154 .56 0 INHEREIN'S RELIABILLIT ANAL YSIS WORKS LLETT TRED CON IT FAILUNE ++ 44. 9901 190. 840 190. .066 1000. 99. 2.7 .56 -DUA:TITY 1 1 1 m 28 4 ∞ 20 4 4 0 4 4 0 UNIT: STEATITE FORM SAST. SLE 3 125mh 0.05 1.5 A (2) 1.25mh 0.072 nr 110 mm (3) (4) (5) (022) S COUT. 490NDC @ SA 350VBC EE RCR 20 & 103 Km (1)
RCR 20 & 121 Km (1)
RCR 20 & 121 Km (1)
RCR 20 & 121 Tm (1)
RCR 20 & 122 Tm (1)
RCR 20 & 562 Tm (1)
RCR 20 & 562 Tm (1)
RCR 20 & 562 Tm (1)
RCR 20 & 131 Tm (1)
RCR 20 & 131 Tm (1)
RCR 20 & 131 Tm (1) CK TOAN 102m (K 333 NUMBER CC20 CH120 T CC20 CH120 T CC30 CH120 T CC30 CH100 D CC20 UT100 D CB2195102K WS 75008-38 WS 75008-21 WS 75008-33 MS75008-41 08-1094/0 GROUP 8-5006 DEVICE IDENTIFICATION COAX, CFRW. CHA W. FIXED MICA MOLDED CERM FIXED FIXED HIXTH B MICA PACK + FIXED Comp. NOMENCLATURE CONNECTOR CAPACITOR SUBSYSTEM: CAPACITOR, CAPACI TOR CAPACITOR CAPACITOR CHOKE, RE 4 100 LIP CONNECTOR CO16, RF RESISTOR いるとの ローレング LUGEX LUGEX ### 13.4.3

SUBSYSTEM: EDUFMENT: GROUP: LAWL YSIS**JARIASHLET* SUBSYSTEM: EDUFMENT: GROUP: LAWLE LAWLET* GROUP: LOWER LAWLET* TUBE: REC. SLIO TUBE: REC. SLIO GAHLLAN GOVARTAL UNIT GOODT'S GROUP: LOOL CRYSTAL UNIT GOODT'S GROUP: LOOL	A series	SUZASSEMBLY: SHEET 2 SE		REMARKS	20	-	l,	1	ſ		1	1	1,					- Al
SUBSTATE REQUIRENT: GROUP: LANDLY YSIST, WAR SUBSTATE BEQUIRENT GROUP: GROUP: CALLY TAIL HOMERCLATUNE RAYCEBERGE (A) TO BE REAL BROOF (, LI	HELY: A!		ζn.		İ	1	990'	65.0	227.5	32,5	32,5	2,0	7				
SUDSYSTEM: EQUIPMENT BONDERS BONDE	URKS	2			.03	1	1	190.	32,5	32,5	32,5	32,5	2.0		7			
SUBSYSTEM: EQUIPMENT NOWENCLATURE NASFORWER ASSY. VBE , REC. TUBE , REC. TUBE , REC. YSTAL UNIT 0.	, h. rsis.	101.22 47-122			=	1	1		2	1	ı	-	-					
SUBSYSTEM: NOMENCLATUNE SISTOR , FIX UBE , REC. TUBE , REC. TUBE , REC. YSTAL UNIT	INHEREN' RELIABILLIT AL	GROUP:		มบเลยล			RJ 65B1781 F (1)	FHW09'	5610	5654	S126/6ALS12	CAHEWA	23,000 SERIES					
			DEVICE IDEN	NOMERCLATUNE	7			1	7	TUBE, REC.	1						THE PARTY OF THE P	

SHEET REMARKS SUBASSEMBLY: 07.76 2 -• = : = = = : = = = ASSEMBLY: A2 OSC. MIXER 7,04 .528 4.4 900. X .. 2,97 ,003 4 .396 -INHERENT RELIABILLY ANDERSISMORKS, LETT FAILUNE 4 2100 4 190. 44 ,060 99. هـ 190: .007 -TRIP GOOV OUA:TITY N CV-7+1 0 5 0 3 23 4 8 0 10 ,,,, UNIT: (STA) CC30CH1803 (1)
CC30CH1803 (1)
CC30CH1803 (1)
CB21F51013 (1) CAVOGAIKEIO4KM (2) ε RCR 206 222 JM(1) ε RCR 20 6 564 5m (2) Sek 544 125mh 0.05m 1,5A RCR 20 & 151 5m RCR 20 & 473 5m CP 11 A 3 KE 104K NUMBER RCR 206 471 JW RCR 206 1535m RCR 206 56135 RCR206 1527M RCR 208 8223h RCR 206 121 JW RCR 206563 JM RCK 206 155 Km 6630001000 6630001010 002003100B U6-1094/U 14-300572M CK COAN 102 M GACUP: LAN/3 DEVICE IDENTIFICATION CERM PARED FIXED CERM. FIXED CERM FIXED Molbina FIXED CONDECTOR , COAX, FIXED NOMENCLATURE CAPACITOR CAPACITOR, CAPACITOR SUBSYSTEM CAPACI TOR CABACITOR CAPACITOR P. RESISTOR SOIL, RF CHOKE 13 DI-ATA LUNGEN L SYSTEM

CYCTELL	subsystem: EGUI	EGUIPMENT: GROUP:	UNIT: 10	T	ASSEMBLY: A2	SUDASSEMBLY:
WLR-16	16		TREE CONV.	ov. 05C,	C. MINER	SHEET 2
X30H	DEVICE	DEVICE IDENTIFICATION	TITANTIT			
า.บะเจยก	NOMENCLATUNE	NUMBER	Z	RATEX	ζη.	REMARKS
		RCR2063225m (1		1	1	20
		RCR 206 4705m (20 -	1		ε
		RCR 206 101 Km (1)		1	1	
		RCR 206 154 Km (1)	- {			
	1	RCR 20G 224KM (1		1	İ	
	RESISTOR, CAR.	428	4	22.0	88.0	1
		RV4LAYSA 105B (1) RV4LAYSA 252B (1)	1	1	1	11
	TUBE , REC.	6C4 WA	-	32,5	32.5	h
	TURE REC.	GAHGWA		32,5	32.5	11
	TUBE , Prec.	8113	-	32.5	32.5	11
	TUPE, REC.	S727/2021W	-	32,5	32,5	1,
	TUBIE, PATE.	5814A	-	32,5	32.5	h
	TUBE REC.	5670	2	32,5	65.0	11 SECURISES
						100000000000000000000000000000000000000

SUCASSEMBLY:	SHEET LCS		REMARKS	2		11		11		11		11	1,		=		11		-	
ASSEMBLY:			Υ Ν.	3,96	6,60	2,64	1	760.	820'	2.47	1,50	57.	1.12		2,2	-	.594	1	.198	
	742b		RATEX	99.	‡	‡	1	.010.	\$70.	99.	sl.	.75	.56)	1,1	د -	290.	1	190.	
UNIT:)[CV-74		A'LII N	4	5	e	1	9	-	8	4	-	4)	ч	_	o	.)	3	
EQUIPMENT: GROUP: U		DEVICE IDENTIFICATION	HUMBER (QTY)	1000pf ±20% 5000bc (2)	0 AW 1021	56.20 4 6.20 (2)	SOUT	CP II A 3 K E I O 4 K (1) CP II A 3 K E 1 3 K (1) CP II A 3 K E 1 0 5 K (1)	s c4703	CBIPEIOZM (3)	JA2 10251	11458	16 COUT. 150 VDC 15A > (1)	15 corr. 4900BC SA(1)	U&-1094/ U	4 PDT, 280 A 27,5 VBC	MS75008-33 (1) MS75008-28 (1)	(1) 17-8005L SW	2.0mh 35mg 3T SE(1)	1000000
CUBSYSTEM: EQUIP	01	DEVICE ID	HOMENCLATURE	CAPACITOR MICA	CAPACITOR FIXED	CAPACITOR, CERMS		CAPACITOR , PAPER	CAFKUITOR , FIXED	CASKOITOR, MICA	Dione	Dio ⊅∈	CONTICTOR PAREL		CONTRACTUR, CORX,	RELAY, GEN. PUR.	COIL, RF MOLEGED		COIL RF	
CASTEM	8-18-10	INDEX	บัวธ:วา:																	

	0 i i i i i i i i i i i i i i i i i i i	SUBASSEMBLY: SHEET 2 DE		NEMARKS	2		11	-		4	•		2	1	11		and a special section of the section		South parabolis.	The state of the s	Ü	
	, <u></u>	ASSEMBLY:		ζn		1))	1	1		١	66.0	1	,150	1	,132	.064	65.0	32,5	32,5	1.
0	, GRKS. IL	7		RATEN	1	1	1	1	1	1	1	١	22.0	1	.03	1	190.	,0¢	32,5	32,5	32,5	-
0	, 4L /SIS*		1	Z N	1			;	,		1	1	3		S	1	7	-	.4	-	-	
	INHERENT RELIABILITY ANAL YSIS WORKSINEET	GROUP:	DEVICE IDENTIFICATION	NUMBER (QTY)	RCR 2061005W (2)	0 (1)	POP 206 4725W (1)	Rep. 206 1835 M (1)	RCR 20G 103 Km (1)	FOR 200 154 Km (1)	RCR, 200, 224 5m/1)	RCR 200 105 KM (1)	RV 4 NEYS 502 A (1)	+	RN 6581003F (1)	158348	im o	781, 1154 57/63 HZ 332, 6:34 67.50 A	5654	5670	CANGWA	
		SUBSYSTEM: EQUIPMENT:		n nomenclatune							1		Resultant The Control	1	RESISTOR, FILTY		TRANSITARINGE, IF	TERNOTARMER, PWR.	TURE REC.	TUBE, REC.	TURE PAIC.	
	-; 	अश्वाहरू के उ	XEDAL	. KUKBEN				,			37											

SUZASSEMBLY: BENA RYS 2 452.738 452.732 32,5 406.09 406.09 XII. INHERENT RELIMBILLT ANAL YSIS WORKS LICET . ASSEMBLY: RATEX 32,5 FREG. CONV. UNIT: 11 CN-7425 QUA:TITY N GROUP: 5687 WA AP 4 DEVICE IDENTIFICATION ASSX. ASSX. NOMENCLATURE OSC . - MIXER TUBE REC. SUBSYSTEM IF AMP, VLR-10 LUBEX LUBBER SYSTEM 88

CV-742B LF AMP.	and a	HATE A	22 .99 21.78	44 15,40	1	6.16	1	9100'	2.7	.192	1,254					-			\vdash
-7425 L. CON.	מחאיתונא	+	4	44	1			-		6.	1,2		.56	177	1	1	1	1	1
	and a	2	4			44,	1	2100,	1.1	190.	2000	1	95.	7 LOO.	1	1	1.	1	
0 %	11		d	35	1	4	1	-	4	12	19	1	1	23	1)		ſ	٥
	10)	AD LOZW		60AW102W	5	CC3003750E (4)	6620 UK 0206 (1)	CPJ09AIKF103KM	VG-290A/U	00500	75008-33 1500?-23	MS15008 -41 (4)		206 510 5m	RCR 2061005th (4)		RCR 20G 102 Km (1) RCR 20G 101 Km (1)	20G 332	RN6583481F (3)
	DEVICE IDI	FIXED	1	CAPACITOR, CERM	/	CAPACITOR, CTRIM		CAPACITOR, PAPER	CONNECTOR, LOKX,	CHOKE PRE	COIL, P.F. MOLDFEL		SONNECTOR PART	RESISTOR , COMP.					DHXI-D
	12 - 16	DEVICE IDENTIFICATION	DEVICE IDENTIFICATION ROMENCLATURE FIXED CELLAR	DEVICE IDENTIFICAT ROMENCLATURE FIXED CAPACITOR MICA CESS	DEVICE IDENTIFE RAME MICA INCANCA FIXED CAPACITOR FIXED CAPACITOR FIXED	DEVICE IDENTIFICAT ROMENCLATURE CAPACITOR MICA CE CAPACITOR MICA CE CAPACITOR CAPACITOR CE CAPACITOR CAPACITOR CE CAPACITO	DEVICE IDENTIFE ROMENCLATURE CAPACITOR, CITEM. CAPACITOR, CITEM. CAPACITOR, CITEM.	MLR-16 INDEX INDE	MIRALIS DEVICE IDENTIFICA HIGH CAPACITOR FIXED CR CAPACITOR, CFRM CAPA	MIRCHS HIGH HOWENCLATURE CAPACITOR MICA CON CAPACITOR FIXED CAPACITOR FIXED CAPACITOR FIXED CAPACITOR OFRING CAPACITOR OFRI OFRI OFRI OFRI OFRI OFRI OFRI OF	MIRCHS HIDEX HOMENCLATURE CAPACITOR MICA COS CAPACITOR, CIRCLA COS CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITO	MIRCHIE HIGEX HOWENCLATURE CAPACITOR FIXED CAPACITOR, CIRED CAPACITOR, CIRCO CAPACITOR, CIRED C	MLR-16 INDEX INDEX INDEX INDEX INDEX INDEX INDEX INDEX CAPACITOR, CIRCLE CAPACITOR, CAPACITOR C	MIRCHIE CAPACITOR MOMENTER CAPACITOR MICA CAPACITOR CAPACITOR FIXED CAPACITOR, CFRAM CAPACITOR, CFRAM CAPACITOR, CFRAM CAPACITOR, CFRAM CAPACITOR, CFRAM CAPACITOR, CFRAM CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITOR, CAPACITOR CAPACITO	MLR-16 HOWEROLATOR BIXED CAPACITOR MICA 1000 CAPACITOR FIXED CAPACITOR CAPACITOR OFFEN CAPAC	MURTIE MUMENCLATURE MOMENCLATURE CAPACITOR MICA (168) CAPACITO	MURLALOR HINGEX HOMENCLATURE CAPACITOR FIXED CAPACITOR CAPAC	CAPACITOR, MICE DENTIFICA ROWIENCLATURE CAPACITOR, CERM, CR CAPACITOR, CAPACITOR CAPACITOR, CERM, CR CAPACITOR, CERM, CR CAPACITOR, CAPACITOR CAPACITOR	MURE IN DEVICE IDENTIFICA INCIDENT PRINCE DESTRUCTOR INCIDENT PRINCE CONTROL OF STREET CONTROL OF STRE

REMARKS SUBASSEMBLY: 42 E = ASSEMBLY: A (292,5 HE AMP. 32,5 40.04 32.5 KH. INHERENT RELIABILITY ANAL PSISTINGRISHILET 32,5 32,5 32,5 CV-7428 FOTO. COUV. QUA:TITY N Citt Or 41 %. 6 HUNGER (QTY) 5726/6ALS RN 65 B 1001 F GROUP: トカエトしとな 5654 DEVICE IDENTIFICATION EQUIPMENT: NOMENCLATURE REC. TUBE , REC. TUBE , REC. SUBSYSTEM: TUBE 518-10 Mackari. SYETEM 90

	DATE 19/30/73	SUDASSEMBLY:		REMARKS	20		11	11	-	11	-	-	=	=	11	11		=	11		=	
	1	ASSEMBLY: A2 S		Υ μ.	11,0	21.0	1	1		6,930	500.	1	، 10	111	٢ و	1,056	,132	,239	1	١	}	1
01	ANAL YSIS' WORKS LLET	4		RATEX	4.	‡	1)	1	99.	,0016	1	710.	1,1	11	990.	1900	1100.	1	1	I	
01	, IAL YSIS	UNIT: 11 CV-742 B FREG. CON	OHA-THE	N	25	4	1		1	7	8	1	-	1	-	1	7	31	.]	1		
	hardenein's RELIABILLI AN	Guoup:	DEVICE IDENTIFICATION	ווטוווםפת (פדיץ)	CK1042102W (12) CK60AW102W (13)	3003	0 (1)	20 UTISOB (CC 30 UT 8205 (1)	1000 PF 420% 500 16C	CPV 09 A 1 KF 103 KW (1)		CP 1113KE 104K (1)	UG-1094/U	485T, 2802 27.546C	.25mh olosa lish	(1) 17-8008/5W	RCR 206 563 5m (1)	RCR 206 471 Jm (2)	RCR 206 822 5m (1)	RCR 206562 JM (1) RCR 206 181 JM (1)	
		SUDSYSTEM: EQUIPMENT:		HOMENCLATU	CAPACITOR, SERM.	CAPACITOR, CERM.				CAPASITUR, MICA	CAPACITOR PAGER		CAPACITOR , PAPITE	CONNECTOR COAX,	RELAY, GEN. PUR,	CHOKE, RF	COIL, RF, WOLDED	RESISTORS, COMF.				
1		11.5 × 15	MOEX	ייטנייטניי.																		

	SHET AS		REMARKS																			
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ASSEMBLY: A2	OSC MIXER		YN.	1			1		1		1	!	132.0		32,5	32,5	32.5	65.0	32,5	32.5	65.0	
	ż		RATEX	1		1	1		1	1	1		22.0		32,5	32,5	32,5	32,5	32,5	32.5	32,5	-
	1 0	OUA-TITY	2	i		-	1	1	1	1	1	1	9	1	-	-	-	2		-	Ч	1
EQUIPMENT: GROUP: UNIT:		DEVICE IDENTIFICATION	ווטאוספת (סדר)	2266 3923 W	(RCR 200 123 Jm (2)	RCR 206.153 JM(1)	RCR 206 122 Km (2)	RCR 206 472 Jm (3)	NN	R 206 101	R 208 224	RCR 208 151 Km(1)	RV4LAYSA105B(1) RV4LAYSA 253B(2)	RN4 LA7SA 502B (3)	6CAWA	GAHBWA	8113	5654	5727 2021W	5814A	5670	
SUDSYSTEM: EQUIP		DEVICE I	поменсталь										CESISTOR, COMP.		TUBE, REC.	TUBE , RISC.	TUBE, REC.	TUBE, REC.		TUBE REC.	TUBE REC.	-
CYSTEM:	218-10	MOEX	บริธาสกรา								2											

DATE 10/25/78			REMARKS	H3-1				7 7 7 6 8 3 8 MIG 48	11 " " " " " " " " " " " " " " " " " "		2.676	87 P.VS			SPINSA		25 CW				
· ·	SUCASSEMBLY:			200	=	=	=	4	=	=		:	=	=	:	=	=	=	<u>_</u>	=	
	ASSEMBLY:		ζ _Ν .	.0732	15%	3.75	20	7.5.	,56	6.9	25.	89.1	2.2	2.8		2.80	.56	8.00	2.2	1.0	
			RATEX	7/00.	810.	24	1.0	.56	75.	/"	75.	75.	19	3/2	/ "	32	25.	7.7		7.7	+
	UNIT: 12 MennTH IND. PUSSE ANPLYZER	GUANTITY	Z	17	2	5	20	`	,	a	/	5	2	6	,	<u>ل</u> م	/	٠ ٢	,	` `	1211 20 11113
	GROUP:	ION	HUMBER	۸۵۷	CM	THNINUS 8		34-2015	MRE-SOP-J	BNC mil U6-194/U	045-255-67	7-5	BUC MIL-UK-1094/0	DAF-455-C7	TELEPHWE JACK (COAX)	DB= -245-C7	30 AMP, 324, 27.	470T, CP	SPDT, 150V, 10 MA	5027, 1504, 10A	
	SUBSYSTEM: EQUIPMENT:	DEVICE IDENTIFICAT	HOMENCLATURE	CA174617012	,,	DIODE	LAMIN IN CANDESENT	CONN	. "	"	"	11	"	"	"		4	PE. NY	"	11	
֡	(MER-1	moex.							93									2			

SHEET & SE DATE 19/24/48 REMARKS SUBASSEMBLY: 52 = = = : = = = = = = = = 10,0 .023 .046 990. .039 .023 X. 5/0 ,031 .039 .039 ,0077 .031 132 harteren i Reliabilli i Analysis workshilet .03 ,03 103 .03 ASSEMBLY: FAILUNE 990. . 20077 1000. 17.00. rr w. 7700. 1000. 1500. 1100. 1.00. 100. 01 ,03 03 .03 ASMOTH IND. 22 03 OUA:TITY ANNIYZER 3 0 2 6 t 3 4 t V RCR 20 6683 KM, +72KA RCR 206 18/41/ 150Km" RCRAOG ISUKWI 1854MW RCR 42GIPHMM, 224EM RN6581331 2370F 1000 MIN 1.65% SAMS NUMBER KCR TO GROUTH RCR 20G1054M RCR 206104 KINT 5000, strant wire RCR 20 GIUSKM RUYNAYSDIOSA RV4LAYSAIO4B RCR 206122 Km RV4NAYSO103A PRELLG 8937M RCR 326337KM GROUP: RUGSBZISTE DEVICE IDENTIFICATION EQUIPMENT: JAKIOBLE METER, MICRO AMP #ILIN NOM: ENCLATURE VARINBUE SUBSYSTEM RF. COIL RESISTUR RESISTOR = : -: : > 1 W18-16 L'USEA SYSTEM

STEM: EQUIPMENT: GROUP: DINT: "T AND LYSIS" "STEM: BEVILE IDENTIFICATION MAJOR LE DENTIFICATION " PPDT STONE, "N" 30" 3" " " " " " " " " " " " " " " " "	٤ .	2	11	11		**,		2	=	11	u u		=	l)		NS	REMARKS	SUBASSEMBLY: SHEET 3 CF	DATE 1927/78	
THE STEAM IN THE PRINCE AND THE PARTIES AND TH	302,941	349,423	320,157	206.141	223,666	1,2	97,5	5126	.064	.064	.064	.40	89.	2.04	7.5	130		:Maly:	ET	1
SITEM: BEVICE IDENTIFICATION BEVICE IDENTIFICATION BEVICE IDENTIFICATION BODD STOVE, S.O. S. S.O. S.O. S.O. S.O. S.O. S.O.	302.941	349.423	320,157	206.141	223,666	7.	97.5	97,5	200.	. 064	790.	74.	89.	89'	7.5	.03		ZUD,	, WORKS.	
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1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	12 45 5-500 M SEC SWEET	PWSE STRETCH'E	O-5 MSEC	PANONAMIC	VIDEO AND 545 1694 0	NEON NE	" CAT SKRT	ELECTRUM CRT	1154,61	" (150 PC, 60 RZ)	RAISTORNER, PWR MKG 8489.		Taga "	TOGGLE, DP MS35059.22 31	"		NOIL	, sucaystem: Equipment: Group:	INMERENT RELIABILITY	1
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INHERENT RELIABILLY ANDL YSIS WORKS LEET

W18-10	4	Eugleneur:	:. 0 0 0 0	DINIE /2 AZIMUTH ZNO PUSSE ANDLYNED	3	ASSEMBLY:	SUZASSEMBLY: SHEET A
*		DEVICE IDENTIFICATIO	TION	-			
הלטונים	NOMENCLATUNE		แบนออล	DUA:TITY N	RATE Y	YH.	BEMARKS
7	1247 0.5 - 50,	DOO WSEC	SWEEP	,	243,992	243.992	2/2
+	12 AS HORIZULALL-	AL-VERTICAL	Amp	/	218.099	218,099	-
1	1249 DE PRE	AMA		,	168.732	168.732 168.732	5
1	12 A 10 SCAN VI	VIDEO AMP		,	182,002	182,002	
1	12A11 DE/SCAN	SELECTOR		'	1,1	0	
1	12A12 SCAN DE	FIECTION		/	215.472	215.472 215.472	
7	12013 FREDUEN	FREDURNCY INDICATOR	~	/	486.291 486.291	486.291	
5	17AH INDICATOR	OR SEKIO AMP	90	`	153,307 153,307	153,307	2
7	12A15 ELECTRICHE	11 EQUIPMENT	T CABINET	\	11,003	11.003	=
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10N 11UMBER 11UMBER 11UMBER 11UMBER 11UMBER 11UMBER 11UMBER 11UMBER 12 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 13 .00/L 15 .00/L 16 .00/L 17 .00/L 18 .00/L 19 .00/	6000P: AZEMALYZA ANDLYZA W ASEMALY GO OLAMITTY FAILURE INUMBER N ATTEN ANTEN A	A SUBASSEMBLY			REMARKS	0 05		32 (,	" 7	u o	, 11 ° °	4	-0	•		и	100	\$100 A 6840	i.	N. S. S. S. S.	Ξ.
10N 11UMBER 11	EUUITMENT: UNINGEN	GROUP: UNIT: /2 ASSEMBLY: /2	10E0 A.			,0016	360'	,0032	.0032	300,	1,76	.44	12.76	,44	,0016	156	,0016	2100.	711	.56	82112
10N 11UMBER 11UMBER 11UMBER 134124241111111111111111111111111111111	EDULIMENT: GROUP: UNIT: AZIM DEVICE IDENTIFICATION ILMBER COLOSPORE 473KM COLOSPORE 473KM COLOSPORE 473KM COLOSPORE 6716 _				1000.	\$20.	9/00-	9100.	40.	33.	24.	747	77.	9/00.	370.	9,00.	9/00.	,5-6	.56	.5.6	
10N 11UMBER 11UMBER 17PIKC224 KM 18E10/6 18E10	SER COVOYPIRCZZY KIN CAISE 106		ZIMUTH KSE AND	מטאיוויד	Z	,	\	7	a	\	r	\	29	`	`	ď	,	/	~	. `	38
	DEVICE I TUNE PAPER "" "" "" "" "" "" "" "" ""	GROUP:		DENTIFICATION	NUMBER	CPV OTHIX CZZY KIN		CP VO9 ALKEAT3KM	CPIIASKC224K	cMISEIS/G.	· CK 60AW 102M	CC 20C 4050C	CC 30CH 180J				COURTH CONTAKIN	CALIGORIKC#73KM	שוברי יישצאה	1	P00.32

4 SHEET. DATE 10/27/78 REMARKS ASSEMBLY: 12 A1 | SUBASSEMBLY SN -= -= = = VIDEO AMP. 132 . 0077 22,0 .0077 1200' 690' .023 .0077 XX. ,023 .023 .039 162.5 410. ,030 ,031 hundereini Reliabilit Anal Ksismurkismett 7100. RATEX 1100. 7500. -1000-1900. 11000 4100. 7700 .0077 17000. 22 17001 32,5 8400 aso. PULSE ANALYZER ARIMUTH HUD QUA:TITY N 7 3 N 6 3 t 3 5847,5814 6CLL,887 121 KM: RCR 206104KM NUMBER VALLE UND RUGLMYSMESIB RCR 206621 JM RCRUZG 352KM RCR 326103KM 80 connections RCA 329,105-KN RCR 206 332 JAI RCR 206 102 4m1 15612626177 GNOUP: RCR 206/50 KINI RN G.B RIOF -681165W DEVICE IDENTIFICATION EQUIPMENT: F1601 NOMENCLATURE SUDSYSTEM: RESISTA CHOKE TUBE = DCS -= -WER-15 RUMBEN. SYSTEM

CATE 79/29/78	SUZASSEMBLY: SHEET CF	REMARKS																	
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,	ASSEMBLY: AZ	ζn	1013	.234	3.00	4,40	1.60	,56	290'	160.	6801	79	.046	80.	,0048	130,0			
OBKS: 16		FAILUNE RATE X	,0016	800.	,22,	1.1	7.1	7-5.	r100.	7700.	. w77	22	7600.	.03	8400	32,5		A STATE OF	
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, wHERE	Gnoup:	DEVICE IDENTIFICATION NUMBER	CINOG ANNEXEX.	CW15 F	JAW IN458 MS27	CN401-F-80		11 CR 75/78 DC-570-C7	RCR 20 GYSKNI	EC # 206 5, -1611 - > 1/401	שנא הספ אחינות	N. GLMYSMAKK B	RCR 32GXX 34111 - 1KIN	RN65-81 x 3 x - 2 x	100 Convecting	100000000000000000000000000000000000000			
	SUBSYSTEM:	DEVICE IO HOMEHCLATUNE	CAUMITAL , PONEK	mich	DIODE	COUN. COPE	RELAY UPDT	Conn.	KES15 TOR	"	,,	" pad 11:31 E	"	" p /Lm	PCB	7086 RECEIVING			
	CYSTEM: WLR-16	Number																	

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LY: SHEET CE		REMARKS								1:					1	1	_	1	1
SUZASSEMBLY:	1		SO	12	-	-	=		-				11 14 W					1 1	
ASSEMBLY: A3 O-SA SEC SWEFP		KN.	1010	.234	2.2	2.7	,56	6.75	111	,56	.33	190.	760'	270.	.039	.015	670'	-	.03
	7	RATE À	Now.	860.	44.	2.7	,56	.75	177	25.	.990.	790-	7200.	7200.	2000.	. 5007	1700-	.03	.03
UNIT: 12		N N	9	B	6		,	0	`	/	7	,	12	8	4	8	.0.	80	,
Gnoup:	ATION	ันบพอยก	CPUMPY : 2C x u + KIN - XXZKIM	C11115E4716-	CC 20CH/JUC - YVOJ	10		TAN 111458	CN 401-F-80	M45-121		115-9442-23	RCR 20G xx 34.11 - 1Kx1	RC2 206 xx 4Km	KCD 206 to treat	RCR 32G xx 2 Km	צר א מא	RN 656 XXX/K - XVV3F	RUTOSXXXZA
Substriem: Equipment:	DEVICE IDENTIFICA	MOMENCLATUNE	CAPPLITOR SAPER	" MICH	" CFR	" VALL, CER	" ELECT, ST	Monk	CONN, CORX		201 202	n 1	R-SISTOR	11		"			
WLR-1	MOEX	บริธากา					1	100					*		1	+			

DATE 12/29/14	SUBASSEMBLY:		REMARKS	"" NS	" "	11						23,64,038		Springer Park Springer Springe		
I, i	ASSELLOLY: AB O-S-RASCC SUREP	9.14	Ųη.	60.	110	010.	195					A.		\$ 18 J. S.		
, vor RKS, rel			RATEX	.03	22	8 hao-	32,5							g (8	POUREY S	
ANAL YSIS'	UNIT: 12 PULSE ALDIYZEK	QUA:TITY	Z	w	٣	ч	9							•		
hurleren i RELIABILLI I ANALYSIS WORKS LET	ent: Gnoup:	HIFICATION	NUMBER	RN 758 xx. F	RV61" 11, xx38	80 Connections							WHENCE THE PROPERTY OF THE PARTY			
П	SUBSYSTEM:	DEVICE IDENTIFICA	HOMENCLATURE	RESISTOR	RESISTOR UNKINBLE	7.8	TUBES RECEIDING			9.11.11		Control of the Control of Control	164.68			
1	SYSTEM: WER-16	I INDEX	\perp					10								

SHEET LCF REMARKS Ns = = = = = = : = = : = = = SUZASSEMBLY: DATE 111 7K 11 1:1 .312 PUSE STRETCHER ,005 ,005 \$10. ASSEMBLY: A4 5,23 227,5 1,50 . S.C 4:4 X3. 110.0 100 1077 ,015 131 ノニ 103 7 INHERENT RELIABILITY ANALYSIS WORKS LLET FAILUNE 1000. . 0077 .0016 91000 9100. 810. 12 .0077 127: 1000. 37,5 .56 1:6 1:1 . 03 .03 22 QUATITY N UNIT: 12 m 1 4 1 8 3 11 of 01 3 5 d 1 4 x . 0.4 RCC325x3 C, XX+K P. 2561112F , XXX3E (PY 09A/4/= xx 34/1) NUMBER CPUSOBIKE XLUKEN RCK 426xx 4x CN401-F-80 GROUP: 4/11/00. CD! NJKE KYLA Renzugnusk THEN INUSS Jun 12 627 RNJOGINGE 20 -00277 CHISCIANT トントイドル Sec. 8 3. 11 DEVICE IDENTIFICATION RVGLAY EQUIPMENT: PNIEK MICA RECEIVER. HOMENCLATURE らいとと 4007 SUBSYSTEM CHPACITOR 8.F. C. 70K TUBE for in Com More -1 ; = 1 = WR-16 T.D. DEA SYSTEM 102

10 J SHEET 24/63/01 REMARKS Sy : : = = SUBASSEMBLY: -= ŕ = -= DATE 174 1111 111 ASSEMBLY: A 5 5-500 MSEC 132,0 2000 .390 1023 110000 ,078 ,56 X2. 801. ,007 162,5 180 ,04C .260 180 2.2 3,0 = INHERENT RELIABILIT ANALYSISMORKSMETY SWEED FAIL UNE 9100. 77 w. 1000. 7200. . 0077 840. 970. 3-6. .75 7.0 .03 32,5 1:1 .03 .03 22 QUATITY N 6 7 UNIT: 12 K 1 5 3 .9 S 9 3 cl CPJOADIXXX3KNI XXX4KM RN65BXXXIF - XXX3F KUTOBXVINEL XXXX NUMBER RN78 22 - 36 . CN401-F-80 81652xxxxx38 GROUP: CMZODXXIG RCO POST CA RCRRZGIVZE CMSEXVIG MUS-LEN TA. 11458 Received RCR 42 KVX DEVICE IDENTIFICATION VARINGLE CER CV EQUIPMENT: PAPER 11:00 11:00 SECKIVER VALINBLE NOMENCLATURE メメンし SUBSYSTE!:: CHPACITOR RESISTOR DINDE Cur. Conn 703E = 51.5711 LUCK LUCSEN 5Y37EM: 103

REMARKS SN : = SUCASSEMBLY: = = = = : F DATE 1 ASSEMBLY: A S 5-500 MSEC 132,0 2001 .390 110000 00. 1..HEREN' RELIABILIT ANALYSIS WORKS LEET YH. ,56 201. 1023 ·045 ,007 180 .060 180 162,5 2.2 3,0 -SWEED FAILUNE 9,000. · 2077 7000-11000. 840. 6100 970. 2-5. .25 7,7 .03 32,5 .03 .03 22 QUA:TITY N 6 UNIT: 12 1: t 3 0 0 0 of 3 CHURALXXX3KN XXX4KM RN65BXXXIF-XXX3F RN 708 xxx, E- xxx30 RN758xxx1/2-3F NUMBER CN401-F-80 CVGSTAYSXXX 3B GNOUP: CMZOD XX1G 80 1068 CA RURRIGINZE C11/5= x21G MUS-LEN TAN 111458 Recesoion RCR426xx DEVICE IDENTIFICATION CER CV EQUIPMENT: VARINGLE PAPER MICE W.C. NOMENCLATURE VALIPBLE FECKIVER SUBSYSTEM: CAPKITOK RESISTOR DIODE Curr Conn. 708E 7 * DI-3711 = .U. DEN SYSTEM:

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	ASSEMBLY: A7 SUDASSEMBLY: 0.5 - 50, 000 Likely 500567	FAILURE . REMARKS	sN " 500, 3/00	\$70.	,234 " "			3,0	* " 700.	. 1700.	1015 1		130 × × 11	'' '' ''	.12 ""	110,0	130,0	
)	UNIT: 12	OUATITY FAIL	3.00	800,	3 1.078	900.	1 .0016	4 .75	TT00. 01	1500- 1	F . 0077	2 -2077	80. 01	2 .03	4 .03	5 22	4 32.5	
INHEREN 'RELIMBILLY AND WSIS BIT.	EQUIPMENT: GROUP:	DEVICE IDENTIFICATION NUMBER	CPV04A1 XXX3M - XXV4.	62137E xx v G	シャン デンシン	CM30 €1× G	CP1.254C7 x14	JA.1 NUS-8	RCRU 20 STYG-XX GK	RCE RUG KX St	RCP 32 CXX	2C12426x43	KAL5 3 4xx . = . 4x35	RN708xxy 1.2 - xxx3F	1275BXXX/F-3F	RUCLAYS YXX 3B		
	SUBSYSTEM: EDUI:	DEVICE I HOMENCLATUNĖ	CHRISTOR	"	7	1/	"	D101E	KE-1570R	11	"	1, 200	,,		, , , , , , , , , , , , , , , , , , , ,	VANIMBLE	TUBE SECENER	

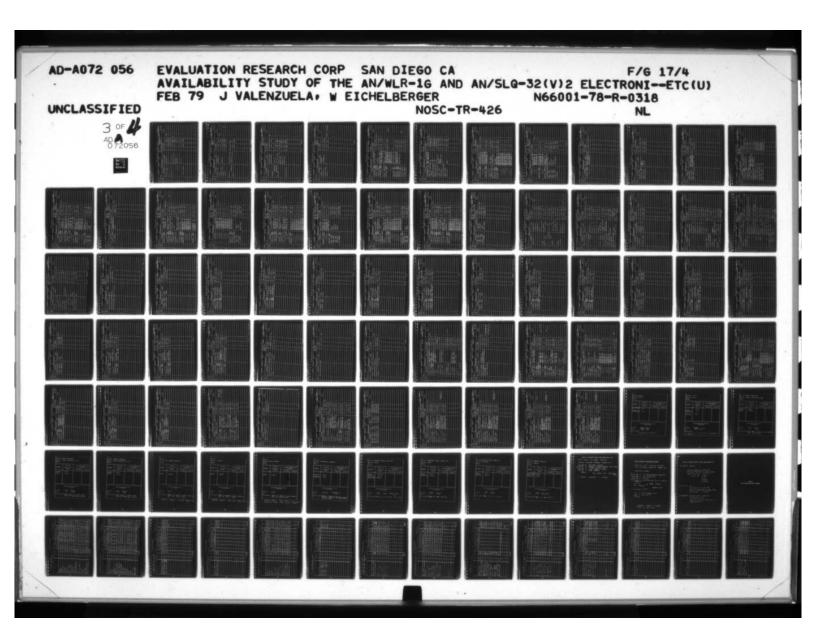
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SHEET DATE 10/19/12 REMARKS SUBASSEMBLY: 25 = = = ASSEMBLY: A B Mack Zonyol – VEXT COL 88,0 ,092 130.0 1000 310 100. INHERENT RELIABILITY AND PSISTINGET . X .. FAILUNE 32.5 1000. 2100. 22 QUA:TITY N UNIT: 12 4 X 7 4 RCR 206 YX14 - YV 4A TOVO 9WIKE 473KM RV6LAY5XXX 38 NUMBER GROUP: DEVICE IDENTIFICATION EDUIPLENT: TUBE, RECEIVER NOMENCLATUNE SUBSYSTEM: CHINCITOR RESISTUR : WLR-16 .. Umbex SYSTEMS 106

SHEET A TENES NS = = = = REMARKS SUZASSEMBLY DATE 1:1 ASSEMBLY: A 9 DF PRE ANID .312 ,0077 +10. ,023 .234 ,231 11972 162,5 harterent Reliability ANALYSIS WORKS LEET X2. 4,5 6. FAILURE 10000 32,5 9/100. 1600. 840. 10000 12% 840. 16. QUATTITY N CH PO MILO t 30 UNIT: 12 0 3 3 ACR206 .. ' - > > 46 Re E 30 G 4012 - 1234 CAVOGAINE 473KIN CINIOLFD XXX JO3 SUXXXXXXX CV NUMBER BCRESOR .. TH GROUP: 7.353 716 W DEVICE IDENTIFICATION EQUIPMENT: TUBE, RECEIVER NOMENCLATUNE SUBSYSTEM: CHPRITOR R. S1570K D.00E -DI-877 יאטאישבע . 2:37:2 107

NN : : -5 = DATE 10 34/19 REMARKS SUBASSEMBLY: 7 111/7 LY 11 111 111 ASSEMBLY: A 10 SCAN UIDE O ,234 9001 .193 ,039 130,0 187 117 3 .031 7.5 44 1.. HEREN' RELIABILLI FANAL YSIS WORKS LETT FAILURE 16000 970 1000. ,0016 ,0077 32,5 .25 22 OUA:TITY N UNIT: 12 t 2 M L 0 4 t 68 アルスメーションションション COUNTAIN X XX NUMBER Per 20GXY SK GROUP: Rubenysmin 70011450 CHISEVXIK DEVICE IDENTIFICATION RCK 39 6 EQUIPMENT: RECEIVER NOMENCLATURE SUBSYSTEM: CAPACITUR RECISANA 708F 21070 ; 01-873 -: LUNGER SYSTEM 108

	DATE 10/29/78	Ë	0 X X X X X X X X X X X X X X X X X X X	пейанко	Ns										
	The state of the s	ASSEMBLY: A 11 DF/SCIN SELECTOR	í.	V	1.6			•		100	8				1
	VORKS, ILE	ASSEM DF/S	FAI		1.6										
Control and Committee of Control	17 KS18'	UNIT: 12	QUA:TITY	2	\										
	INHERENI RELIABILLIT ANALYSIS WORKSINETT	gnoup:		แบพอยก	MIL RY4163A3101										
	topood Speed Foods Speed	SUBSYSTEM: EQUIPMENT:	DEVICE IDENTIFICATION	HOMENCLATUNE	RELAY GPDT										
STATE OF THE PARTY	11	SKITELLE VLR-16	XEGM	Auroch				109				,			





SHEET LOF DATE 10/29/78 REMARKS SUBASSEMBLY: = 2 = . 111 ASSEMBLY: #12 SCAN DEFECTION 2100 .472 65.0 28.0 Language 55 10077 XH. .031 .43 ASSEMBLY -43 haderent Reliability ANALYSIS WORKSHET FAILURE .236 21000 1000. . 00 77 122 32,5 .43 .43 22 PULSE ANDLYZER QUA:TITY N UNIT: 12 d n 1 t O. NUMBER Kullmysnin 3 B RCA 20GXX 3 2 CPUMBerry PINEH10333 Res 20 Gx 5 52 GROUP: MICR 27780 Rus 521 '03 Co 5105 ma 5-615-17-0 3618. A>M DEVICE IDENTIFICATION EQUIPMENT: RECEIVER NOMERCLATURE 00 CHINA TOR SUDSYSTEM: 25557VK 703E MOTOR アルシン ? 11 . 1 1 のーとろう LURGEN . SYSTEM

Construction of the Constr

I	DATE 10/29/78	SUBASSEMBLY:		REMARKS	20	h	ا،	h	1,		r,	-	9 ', '				200			
)	ASSEMBLY: A13 S FREDVENCY ENDICATOR		Υ ε.	55	زه	8.236	2,60	00.	0,-21	768	:	. 12.354			1.50				481 991
	ORKS, LE	ASSEM FRESH ZNOV	1	RATEN	55	1.0	8.236	0.289	0.00	150	72	6.1	2.059		10					
	۳۶۱۶۰۰	UNIT: 12	VIII.2110	N	`	9	`	0	B		81		9							SUR OF N Xs
	INHEREIN' RELIABILLI T ANAL YSIS WURKSINETT	GROUP:	TIFICATION	้นบพธะก	mex 19070 524/4X7-4		(4 BEARINGS				RV61AYSA XX18 - 38	NAUTO1, HOWY LANTON								
The second secon		SUDSYSTEM: EQUIPMENT:	DEVICE IDENTIFICATION	NOMENCLATUNÉ	MOTOR 1.5W	LAMP	COUNTER, MECH.	GEAR	SPRING		RESISTOR	11 VACIABLE PREC.	BENKING					National State of the State of		
1	+ 1	SYSTEM:	MOCK	หลังพูด							111									

INHERENI RELIABILL TANAL YSIS WORKSINGET "

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DATE 10/24/78	SHE SHE	REMARKS			PREUR M. MOINT, ITEM		ALANGA TO THE TOTAL TOTA					7 2 15			10 10 10 10 10 10 10 10 10 10 10 10 10 1		
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ORKS, LEE	ELECT EQ	FAIL	=	9100.	60.0	000					100			6			-
ANAL YSIS' WORKS, LET'	UNIT: 12	QUA:TITY	1	a	\	\											SUT OF U Xe
TradeRein's Retiability	GROUP:	DEVICE IDENTIFICATION NUMBER	mak 02519 6-10493	CP53811FFXXH								and the second				G 4. 1987 4 11 11 11 11 11	
	SUDSYSTEM:	DEVICE IDEN HOMENCLATURE	motor FAN	CATHEITOR	FILTER (A/C)	SPRING		Company of Loth	10 CHO 10		d sakara to make		The state of the s				
1	SYSTEM:	เลยสน เลยสลา						113									

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SUDASSEMBLY:	T LEARNS		REMARKS			1				1 28++		-		1.	1	-	PA		II II II II II II II II II II II II II		
ASSEMBLY: SL		-	γn.	250.	V	10.0	5	1	د ا	.0924		1		2,5	242	.00,	17.2		1,36	1 = =	8
	J		TY FAILUNE RATE A	210.	.75	0,	.56		٠, د	1000	1	1	1	2,5	22.0	.03	و	1.7	87.	1:1	
UNIT: 13	C-2697 6	-	GUA:TITY	4	-	0	M	1	-	7	1	•	1	-	=	4	7	.4	d	-	
GROUP:		DEVICE IDENTIFICATION	NUMBER (QTY)	CP5381FB40SK	12645	MS25237 - 328	34 CONT. 5A 2100 VAC (1)	. DBF-255-0	r, 280a 27,54	द्व	RCR 206 12 1 Km (1)	RCR 208 102 Km (1) RCR 208 331 Km (1)	RCR 206181Km (1)	RPIOIFH3ROKK (1)	RV4 NATSK 503B (2) RV4 LAYSA 104 B (9)	RN6581473F (2)	5000 2 10% 2w				
SUBSYSTEM: EDUIPMENT:		DEVICE IC	HOMENCLATUNE	CAPACITOR FIXED	DIODE SECTIFIED	LAMP INCAND.	CONTECTOR PACK		RELAY , GEN. PUR,	RESISTOR, COMP.				RESISTOR , WW.	RESISTOR COMP.	RESISTOR , FILM	RESISTOR, W.W.	SWITCH , ROTARY	SWITCH, TOBOLE	SWITCH, SENS.	
SYSTEM:	FIR-IG	INDEX	บอยา												1						

	SUDASSEMBLY:	25.		. REMARKS	Ns.		-		1	11				1	11			A TANK TOTAL		
	ASSEMBLY:			γn,	1004	502,802	117	87,428	33.736	3,552	306.	. 472	. 48.	04-	.472					010100
ANAL YSIS''' ORKS, I'ET	ASSE			RATEX	.064	502.902	1,12	87,428	33.236	1:336	.236	.236	**	.70	.236				150	1
T YSIS'	UNIT: 13	c-26976	OHIA-TITE	N	-	1	1	1	_	4	3	4	y -	7	7					1
Independent Reliability	GROUP:	The second secon	NOI	VON .	PRJ. 115JAC S7/63 HA SEC. LVAC 0 4A SEC. 613VAC 0 2.3A	Ą۱	A2_	A3	44		1(エ (・) 24エ(2)	STAINLESS STEFIL			48T		Total Control			
	subsystem: Equipment:		DEVICE IDENTIFICAT	HOMENCLATUNE	TRANSFORMER, PUR,	SERVO AMP. TUNER ASSY.	CABINET	MAN. TUNE DRIVE ASSY.	STORAGE CHAN. ASSY,	CLUTCH, MAGNÉTIC	GEAR PINION	GEAR, BEVEL	COUPLING, SHAFT, FLEX.	BEARING , BALL	GEAR, STOP	STATE STATE OF STATE				
11-	SYSTEM:	2LR-10	LINDEX	บริธาณา						115										

INHERENI RELIABILLI ANALYSIS WORKSILLET

	SHEET L CE		REMARKS																	
SUBASSEMBLY:			JR.	200	2	- 2.				-	. = .	. =	. ÷		;	.5		.2		.2
ASSEMBLY: A1	SERVO, AMP.		ZH.	610.			40.	1	3,00	6,82	٠. د	.56	.354	1	1	1	1	1	1	ĺ
ASSE			RATEN	100.	1	1	210.	1	.75	4.82	7.6	.56	1100.	1.	1	1	1	1	1	1
UNIT: 13	C-26976	A LL VIII O	N. N. N. N. N. N. N. N. N. N. N. N. N. N	12	1	1	4	1	4	-	-		46	1	1	1	1	.1	1	1
GROUP:	3	NTIFICATION	ווטאוספה (פדר)	CPY 09AIKBIO4K (1)	CPV 09 AI KE 332 KM (2)	CPV09 AIKF 103KM (3)	SYAIRC 472 KM (10mf ±20% 200 UDC (1)	TAN 10458	4 PNF TRANSISTIAS + TRANSFORMER	4PBT, 2802 27.5 UBC	25 CONTACTS D8-25P-C7	RCR 208104KM (8) RCR 426 683KM (1)	RCR 206 103KM (4)		326 333 KM	326 39	30	50	126 2 426 1
SOUSTSTEIN: EDUINMENT:	91	DEVICE IDENTIFICAT	NOWENCLATURE	CAPACITOR , PAPER			CAPACITOR, PAPER		DIODE, SILICOD	CHOPPER, TRANSISTOR	RELAY, GEN. PUR.	CONVECTOR, PANEL	RESISTOR, COMP.							
	WLR-18	LUDEX	A.Vinasa																	

DATE 10/30/18	SUGASSEMBLY: SHEET 2 CF		NEMARKS	Sh													20.0 \$ 6.030		244011011V	
	A W.P.		VN.	1			132	1	1	78.	.02	وی،ه ۱۱.	97.5 "	65.0	130,0	. 0048			6	
"GRKS" LE	ASS Q		RATEX	1		1	22.0	1	1	5.	.02	32,5	32.5	65.0	65,0	.0042				
YAL YSIS'	UNIT: 13 C-26976		N N	1	11	1	د	1		4	-	7	М	-	7	-		•		
MILLINE	Gnoup:	DEVICE IDENTIFICATION	HUMBER (STY)	RCR 206472KM (1)	1	RCR 204 103 JM (2)	RV4LAYSA253B (2)	YSA 105B (YSA 252 A	RN291162 (1)	SEC. 6802 SOON	5814A	12AT7 WA	OBZWA	6005/6ABSW			100000000000000000000000000000000000000		
1	SUDSYSTEM:	DEVICE IDE	HOMENCLATUNE				RESISTOR, JAR.			RESISTOR, WY PUR.	TRANSFORMER, AUDIO	TUBE , REC.	TUBE, REC.	TUBE , RECT.	TUBE, RECT.	P.C. BOARD		35/10	9.	0.4
	SYSTEM:	NEEK!	1.U:-3£A																	

10/30/18	SHEET	REMARKS												
CATE			100	=										Market State of the State of th
T T	CABINET	YH.	117	1										+
ORKS, LET . ASSEMBLY:		FAILUNE		01										
42 YSIS'	c-26976	OUA:TITY N		1										
INTERENT GROUP: UNIT: 13 ASSENBLY		DEVICE IDENTIFICATION NUMBER	1	34 CONT. 21004AC SA (1)	76 22 50 60 50	Mark I was	34	And the second second					BALLANTEN	
SUBSYSTEM: EQUIPMENT:	9	DEVICE IDI HOMENCLATURÈ	CONNECTOR PAINT					A DESCRIPTION OF THE PARTY OF T						

SHEET - OF -REMARKS ASSEMBLY: A3 | SUBASSEMBLY: 200 = C-26976 MAN, TUNE DR. 3.068 1,776 17,76 0:10 5,60 XX. hundereini Reliabilli Tanal Ksistudricett FAILURE ,236 -06. OUA:TITY N UNIT: 13 9 0 73 60 100Ks +33% 6.9W NUMBER GROUP: 167 (10) 607 (3) 5A2350C DEVICE IDENTIFICATION EQUIPMENT: RESISTOR, WAR, IM. BALL HOMENCLATURE GEAR PINION SUBSYSTEM: BEARING VIR-16 LUNCEX LUNCES SYSTEM 119

1 00 . NEMARKS SUBRSSEMBLY 92 = = STOR, CHAZ, ASSEMBLY: A 4 1:0 22,0 .236 3 INHEREN 'RELIABILL TANAL YSIS WORKS LEET .236 FAILUNE 10 -C-26876 OUA:TITY N 200 UNIT: 5A @ 125 vbc 3A @ 30 vbc Tyb. 4A@ 30 vbc RES. MS25237-328R STEEL NUMBER GROUP: STAINLESS DEVICE IDENTIFICATION SM3-T TAAS EQUIPMENT: BEAR, MITER, NO.1 いないすのたりいいいい KOMENCLATUNE LAMP, PAZEL SUBSYSTEM: DI-875 LUTER ... :YSTEM:

1						
ا .ز		INHERENI RELIMBILLI ANDE YSIS WORKS LET	, A. Y.SIS*	, ORKS, ie	ET	PATE 1 10 1 10 1
27.5		GROUP: UN			ASSEMBLY:	SUDASSEMBLY:
3	WLR-16	Ţ	FRED. D	ALSC.		SHEET LCE.
LY DEX		DEVICE IDENTIFICATION	0118-7117			
	HOMENCLAT	HUMBER (STY)	N	RATEX	ζι.	BEMARKS
	CAPACITOR, CERM,	CK70AW102M (11)	11	4.	4.84	24
	CAPACITOR , TAMER	CP5382EF205M	1	010.	210.	11
	CONNECTOR, COAX.		8	1.1	9.9	11.
	CONTROLLOR PANEL	VAC 154	-	18.	75.	
	RELAY, COAX,	SPOT SON 100W SOMME	-	-	-:6	1.
121	TRANSFORMER, PWR.	6044 85A	-	,064	.064	=
	160MHz GNV, ASSY,	AI	_	181,205	181,205	1
	COMME LIMIT DISC. KSSY.	A2_	-	289.910	289.910	
	AUTO, FREE, CONTROL ASSX.	43	-	217,260 217,260	217.260	
	II MHE. DISC. ASSY.	A4	-	159.846	159.846	1-
	VIDEO AMP, ASSY.	AS	-	128.622	128.622	
						3.
)	000 000	

-1 10/31/18 REMARKS SUBASSEMBLY: DATE 7 = ے = = = = -= = = = -= = = BULERTER 10,50 2,20 ASSEMBLY: A スンプ .924 1.25 117 XY. 990. .085 160MNZ 32,5 97.5 32,5 60. INHERENI RELIABILLI TANAL YSIS WORKS LETA FAILUNE 900. 4 25 4 990 in ,007 32,5 32,5 = 32,5 .03 PREB. DISC. QUA:TITY N 24 RF-898 1 10 4 4 4 3 3 UNIT: 1 CONT. SOOVER PLAS. 81. (1) 2007005 (Q+1) イジー SCENT 490VBC @ SA CKEDAWIOZM (24) 68 3 3 3 (ϵ) ε (3) ∂9 3 3 EB 470 pt ±5% 500 RUKBER MS75008-35 0,25hh 0,05m RCR 206 472KM MS75008-23 RCR 20G 100 5TM RCR 206 474KM ME 75008- 26 ms15008 - 34 CC20UKO20C CC 20 CH 200 & RCR 20G 181KM RCR 206 101 KM RCR 206 471KM RCR 205470KM CC 300 5101 3 5725/6AS6W RN6585110F DA-158-C7 GROUP: DEVICE IDENTIFICATION 5670 5654 EQUIPMENT: FIXED FIXED CERM. Wo bet CLIRM FIXED , COAX みとりメ ナ PA·X PIXED SMP. FIXED FILM NOMENCLATURE REC. REG. BETO: CAPACITOR, CONVECTOR CAPACITOR RA CAPACITUR SUBSYSTE!!: Constactor, Coll, RE RESISTOR, RESISTOR TUBEL CHOKE TUBE 一つ品紙 カーとう 1.0EX SYSTEM

122

SHEET 2 CF. REMARKS SUBASSE ... BLY 72 < ASSEMBLY: A1 160 MAZ. らか用るて日の 010' 10100 4.0 XZ. INHERENT RELIABILITY ANALYSIS WORKS LETT FAILURE 6.6 ,0048 FREG. DISC. QUATTITY N RF-898 2 NUMBER (QTY) Stowertone 1SER. RES. GROUP: EYOXY DEVICE IDENTIFICATION CRYSTAL , QUARTE NOMENCLATUNE P.C. BOARD SUBSYSTEM: クレアーの LUSEX LUXBER SYSTEM 123

SHEET LCS. 3 REMARKS SUBASSEMBLY: DATE NS = = = = = = = = = = = = = = ASSEMBLY: A2-LIM. + DISC. 15.84 .792 3.29 3 .56 3,3 1000 3,3 シニ 0 -3,0 720 INHERENT RELIABILITY AND PSISMORKS LETT FAILURE .44 1901 25 . N. ,000, .75 -= 4 = .03 FREG. DISC. DUA'TITY N RF-292 36 4 4 M 4 24 ~ 3 3 3 UNIT: 410pf ±5% +250ppm/0c -SVAC 6mg TRIP (011) 9 SA 3 (30) পূ 3 3 Ξ EE CL31CNOZOMP3 = RCR 208 121 Km RCR 206 104Km RCR 206102Km 4900BC RCR 206821Km RCR 20 8561 KM CC 20CKORS C NUMBER CK 60 A 2102 M DPDT, 28 NDC OR RCR 206562Km RCR 20 & 221Km CC 30 UT 10 1 J RCR 206 121K PC36H080 MS75008 -34 RN6581871F RN6582871F RN6581961F GROUP: RN65875ROF 12261 Scort. DEVICE IDENTIFICATION EQUIPMENT: FIXED ELECTRO, total transport transport transport to the transport transport to the transport transport to the transport transport to the transport transport to the transport transport to the transport transport transport to the transport t + GLASS MOLDED GLASS CONDECT OR PANE X 490 FIXED CERM, BACK FIXED DIODE SILICON FIXED ALXED TIEN NOMENCLATUNE CONNECTOR SUBSYSTEM: CAPACITOR, CAPACITOR. CAPACITOR, CAPACI TOR RESISTOR Soll. PT RESISTOR RELAY 5-R-18 LUSEN .. SYSTEM 124

SHEET 2 CF REMARKS SUBASSEMBLY: DATE 52 = --= = = : = = = FRED. BISC. LIMITEISC. ASSEMBLY: A2 44.0 Somth. 17.7 10000 32,5 ¥. 198 162.5 ,010 INHEREN FRELIABILLY ANALYSIS WORKS LEET FAILUNE 22,0 2,0 32.5 32,5 010. 2400 UNIT: 14 RF-89D QUA:TITY N 4 4 V M d OTY 4 3 RV6 LA7SA 2528 (1) 380 RV LLAYSA1038 (1) RN 65 B 3161 F (1) RN 658 4624F RN 65B 1333F RN 658 3480F RN 658 1413 F NUMBER RN 6584642F RN 6584640F RN 65 85621F RN 65B 1103F RN6586810F RN 658 1004F RALSBSB20F EPOXY 20K-2 ±10% GNOUP: 6826 5684 DEVICE IDENTIFICATION CLASS EQUIPMENT: Conny RF TRANSFORMER なな NOMENCLATURE . REC TUBE, REC. SUBSYSTEM: BOAR TO RESISTOR RESISTOR Speciment of the last of the l TUBE Sici State I のーろろ LUMBEN ... SYSTEM 125

REMARKS SUBASSENIOLY Sa = ٥ = = = = = -= = = : : = AUTO, PRED, CONTROL ASSEMBLY: A3 .032 7/19 2.64 066 XN. .56 .75 77 .123 .56 HUMEREN FRELIMBIELT ANDE PSIS WORKSHIET 44. 0. 4. 20 500 990. 1000. ここ .00 RFB. 215C. OUA:TITY N 4 4 N e M UNIT: 470of ±5% +250 pm/c Out ±20% 2000/8C (1) 28VDC OR 115VAC@2A HUNDER (QTY RCR 20G 103KM (2) RCR 20G 473KM (1) RCR 20G 104KM (1) 6 3 6my . TRIP ટ 9 3 RCR 206 471 Km (1) RCR 206563Km (1) Rer 20 G 8 22 Km (1) RCR 206152KM RCR 208222KM RCR 206 224KM RCR 20 & 105 KM (CP 11 A3 KB 10 5K RCR 206561 KM RCR 426 102 Km RCR 200154Km CK 60 AWIO2M CC30U3620J CC 20 CH100C MS75008-35 MS75005-34 CC 30051013 MS75009-41 GROUP: Soover OK-2 Col DEVICE IDENTIFICATION EQUIPMENT: PIXED CERM. SIL, RF, MULDED GEN, PUR. PAPER FIXED CONNECTOR , COAX, FIXED GREW. FIXED CONTROLL , CONX. FIXED COMP. MOMENCLATURE CAPACITOR CAPACITOR, CAPACITOR SUBSYSTER CAFACITOR RESISTOR RELAY 121R-16 ...DEX SYSTEM

SHEET 2 OF -REMARKS SUBASSEMBLY DATE 200 -Ξ AUTO, FREED. CONTROL --: = = = = 140 ASSEMBLY: A3 65,0 32,5 65,0 .0048 3:6 32,5 XX. INHEREN ! RELIABILL ! ANAL YSIS ... ORKS ... ET .. RATEX 32,5 32,5 32,5 32,5 ,0048 3:1 .03 FRED. DISC. UNIT: 14 QUA:TITY N 00 2 4 (:)(AEE 30:0 RCR 206102 Km RN65 B1783 F RN6583160F RN6581473F RN 75 B 4532F NUNBER GROUP: 1K-4 +10% CAHCEA 6C+CA 5654 5751 DEVICE IDENTIFICATION EQUIPMENT: TIXED RESISTOR , FILM RESISTOR, CAR. TUBE , REC. NOMENCLATUNE TUBE , REC. TUBE , REC. TWBE , REC. P.C. BOARD SUBSYSTEM: とろう LUNCS A SYSTEM: 127

DATE 10/31/78	SUB/		BEMARKS	2/8		1		11		=	=	II	11	11	, company of the comp	11	11	The second secon	-	-
ET*	IMME. DISC.	L	ζN	6,16	1,32	3,0	3,3	3.2	.462	.56	.146	1	1	1	1	1	44.0	861.	32,5	0.59
, works	5		RATEX	44.	‡	SJ.		9 -	990.	.56	12000	1	1	1	1	1	220	190.	32,5	32,5
he rsis	UNIT: 14 REG. BIS	1 3	A' I I N	4	8	4	8	4	2	1	19	1	1)	1	4	.8	•	2
INHEREN ' RELIABILLIT' ANAL YSISTWORKSILET	GROUP:	NO	NUMBER	CK(CC 205H060D (2)	1251		25VBC 0	MS 7500	SA		RCR 206 272 Km (1)	206	RCR 200 121 Km (2)	RCR 206 104 Km (2) RCR 206 105 Km (2)	RCR 208 474 Km (2) RCR 208 564 Km (2)	AYSA 504B (L'BA7	5654
٠.	SUDSYSTEM: EQUIPMENT:	DEVICE IDENTIFICAȚI	NOMENCLATUNE	CAPACITOR,	CAPACITOK , CERM.	DIODE, SILICA	CONDECTOR, COAX,	RELAY	COIL, RF, WOLDED	CONNECTOR , PANEL	RESISTOR, COMP.						RESISTOR, COMP.	TRANBFORMER, RF	TUBE, REC.	TUBE, REC.
	SYSTEM:	. Junex	r.Umbe n						12											

	SUDASSEMBLY: SHEET L DE	BEMARKS	*2	=	=	-		-	=	1	1				11				
	ASSEMBLY: AS	Υ.E.	M	.032	900'	870.	.032	3,3		790.	.56	.139	1	1	1	1	1	1	The second second second second second
Y ANAL YSIS WORKS WET		FAILURE	1,1	910.	.001c	810.	5 7	-:-	د =	190.	.56	.0077	1	1	1	1	1	1	The state of the s
NAL YSIS	RF-895 FRED BISC.	GUANTITY	1"	4	4	-	4	M	-	-	-	18)	1	1	1	1)	THE REAL PROPERTY AND ADDRESS OF THE PERSON NAMED IN
huderen' Reliabit'	GNOUP:	Noi	1000	CPOSAIKB224K (1)	CPJOGAIKE 473KM (3)	~	1.0mf ±7.000 200 100 1	m. 50 -1094	. 4	sec.	15 CONT. 490 JBC SA	RCR 206 332 Km (1)	RCR 206124 Km (1)	RCR 426 333 Km (1)	126 103 Km (208 103Km (200	RCR 206 473 Km (1)	P.II. 1 4 X A S O L B (1)
B	EQUIPMENT:	DEVICE IDENTIFICAT	FIXED , ELECTRO	FIXED.		FIXER	PAPER.	COAX.	J. PUR.		PACKE	FIXED Gamp.							VAR.
	SUBSYSTEM:	NOMENCLATINE	CAPACITOR	CAPACITOR	CAPACITOR	CAMCITOR	CAPACITOR	CONFECTOR, COAX,	CELAY, CEN.	COIL, RF	CONFECTOR	RESISTOR							
11	SYSTEM:	HUNDEN						129											

SHEET 2 OF DATE 10/31/78 REMARKS SUBASSEMBLY: 200 = = : FREG. BISC. VIDEO AMP. ASSEMBLY: AS 32,5 32.5 32,5 INHEREN FRELIABILLI TANAL YSIST ORKS LEET'S 010 X. 10100 FAILUNE 37,5 32,5 32,5 ,0048 QUA:TITY N UNIT: 14 d HUMBER (QTY) EPOXY, GLASS CAHE CA 640 6 WA GROUP: 2670 DEVICE IDENTIFICATION KEC. P.F. REC. NOMENCLATURE P.C. ROARD SUDSYSTEM: TUBEL TUBE , TUBE 5-R-10 . UNDEX SYSTEM:

	SUBASSEMBLY: SHEET 6F		. REMARKS	Ns		"	"	111		The state of the s				11		200.		1, 1,	1 11 11 11 11 11 11		
19.	ASSEMBLY:		, KN	.032	.032	.032	.032	190.	9.0	1.6	77	.40	3.2	190.	990.	.132	0/	.308	1.694	.385-	1
ANAL YSIS " ORKS " LET "	Kreen	-	RATEN	100.	2/0.	310.	910.	710.	0.1	9.1	1.6	.40	7.6	190.	2900.	990.	0/	. 0077	7700.	2777	
NAL YSIS	UNIT: 15 POWER S.		N N	`	ч	п	α	7	9	,	,	`	2	`	`	٧	'	t.	22	5.	SUM OF N ME
INHERENT RELIABILITY	GROUP:	DEVICE IDENTIFICATION	NUMBER	CP60BIFHYYSM	CP70BIFGXX5M	CP72 EIEF XXCH	CP 09 A1	CATO FF, CP41 FE	MIL FOSASSOX/	Plulis 5 HAPS	(April	(6/3) 324 6/4	かい	104, 60 MB, SEALEU	54.170 me/24 1240	3H, 55 1118/5 4 100 mg		RCR32 xx cid	RCR236 XX 14-44	RCRUOG XX 54	
	16 SUBSYSTEM: EQUIPMENT:	OEVICE IDER	ROMENCLATUNE	CAPHLITOR	"	"		"	FUSE	RELMY DADT	" SPDT	" SPST, Hermy	Tada	CHOKE	"		METER	RESISTOR	" "	8	
1	SYSTEM: WLC-1	INDEX	เประยาก							131									-		

WHENEN HELIABILLI TANAL YSIS WORKS, LET .

7	SHEET 2 CF _		REMARKS				= =				: :		-		÷	-			: ::	٤		
SUDASSEMBLY:			AE.			177						WY I''									200000000000000000000000000000000000000	
ASSEMBLY:			ζη,	1.386		88	277	0.86	0	8.	2	, ,		0.68	74.	.32	130	185	325	11.096	16.51	794.339
ASS ASS	1-110	-	TY FAILUNE RATE À	7700.	0.7	22	7700.	*	0	0.0	.0.	1,		99.	14.	.064	57	65	32,5	11.096	75%.	
UNIT: 18	P12156 D	-	מטאיזוודא	18	w	t	d	а	`	n	00	,			\	4	X	3	. 0	,	22	SUM OF M X's
GROUP:		DEVICE IDENTIFICATION	NUMBER	RCRUZKKIK - 4K		PUGLAYSYNY B	RC1232 XX14 - XX4X	1	ų	र अरोक्ट्रक्र में हर	RN65BINE	Spor 2 Sec . 250	d	11.52 0 449 9 113 51 05 452 A	4000	STEPLO NER SEALED		D100E)	3120A94	T CHBINET	1N 3614 (50) 161202	
		מבעוכב וסבי	ROMENCLATURE	RESISTOR, FIXED	Count winetscant	RESISTOR Variable	1 = 1×c0	n d	" "	И В	4 //	SWITCH ROTHRY	" 70公公(后		STORY CHARACTER	THANS KORINER DOWER	TUBE, RECTIFIER	TUBE, REGULATOR GAS	TUBE, RECEIVER	AIS ELECTRICAL EQUIPMENT	N 20010	
W12-16		X TOW	MUNCEN.							132						2	1	-	K	AL	10	

144.334 WTSF = 1259 HRS

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	SUBASSEMBLY: SHEET 1 CF	REMARKS	200		1							2 CA		TOTAL PROPERTY OF THE PARTY OF	10 Personal (CEC) (10 Personal CEC) (10 Personal	
	BLY: A/S	YN.		910.	2/0.	490.	2		12							11.096
URKS, ILE	ASSEMBLY:	FAILUNE	11	910.	2/0.	470.			0.000							
NAL YSIS'	UNIT: 15 Power Supply	QUA:TITY	`	,	`	7										SUM OF N Ne
INHERENT RELIABILITY ANAL YSIS WORKS WET	Gnoup:		567.1-5 HOT 15.1	(P55 81 FF 6010	CP5-5 81 EE 400V	1254, 10#										\$
	SUDSYSTEM:	DEVICE IDE NOMENCLATUNE	MOTOR, FAN	CAPAC 1701		FILTER , RFE							001-00100000000000000000000000000000000			
1	SYSTEM: WLR-16	RUSSEN						13:	3							

HAMBERT RELIABILITY ANAL PSIS WORKS LET . .

SYSTEM: SUBSYSTEM:	EQUIPMENT:	GROUP:	UNIT:	16	-	ASSEMBLY:	SUBASSEMBLY.	12/12/20
WKR-16			36	POWER SUMMY				SHEET CF
n n n	DEVICE IDENTIFICATIO	NOL			-			
GEN NOMENCLATURE		NUMBER		OUX:TITY N	RATEX	ζų.	REX	REMARKS
CHIMACITOR	CPC	CP60BIFHXX SM		ı	.016	960.	×2	
	760	CAVOPAIKEIJUKN	600	7	2/01	-112		
	CPIIA3	KC/OV K	7000	9	910.	960'	*	
	Coros	CDTOSIENXX5-K	زهار	7	910.	.//2	1 / 1	
	(P72K)	EIE IOCK	2000	-	100.	710.		
	CPSHO	CPSYBIEGIOSM A	10001	,	910.	3/0:		
	0/10	CO 11 19 3 KF 103 4 6.	2000	8	910.	840.	11 11	
	CN115	5/0/6	5000	8	860.	,23k	·, //	
	(D)OP	CALOUS MENY IN	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	,	9/0.	10.		
DIODE RECT	113614	419		36	.75	27.0		
LAMP MENUDESCENT	CENT			(J)	1.0	3.0	4	
SWITCH INTELLOCK(P/8)	(8/4)			2	.46	0.92	-	
FUS &	602	F028250W		9	0.1	0.0	=	
RELAY GD	4007	T P/23509-9C		α	7.6	3.2	=	
000 "	DP07. 5-11	5-H P/W/15	· \		9./	7.6		
REACTOR	9/	100 MB , 2-10H	N		0.066	0.132		
(20018)	A-5H	414025-008	7	0	990.0	0.132	I	
			SUM	SUM OF N Xs	1	37.33		

SUM OF N X

	. 62/80/ex 1900	SUBASSEMBLY: SHEET 2 OF		REMARKS	- N	-	1 年 注 3 其 其 其 其 其	, ,	±		二、江京发展发展			M. MINI		4	=	-		-	=	
II.	ETT	ASSEMBLY:		ζη.	990'	0/	4004.	1480-		8701.	t	110	22	~		, 63.		1.8	1.7	94.	81.	157.1084
	ANAL YSIS WORKSHEET			RATE Y	0.066	0/	7000.	1001		7700.	.03	22	22.	.43	.43	.03	6.0	0.9	1.7	0.46	0.68	
0	AL YSIS	UNIT: 16 POUVER SUPPLY PP-2/57D		N N	\	\	52	//	١	11	15	6	,	14	,	/	4	7	. \	,		SUM OF N XS
	INHERENT RELIABILLIT AN	GROUP:	DEVICE IDENTIFICATION	HUMBER	34. 25 ma/44, 100 mg		RCR 206 xx/4 - xx4x	RCP 206 xy 5-K	RCR 32 5 xx/- + x	RCR 426 KIKILI - XX4KNI	RNG5 BAXXI - 44 14W	RV4-1450xx1-4A	RV41VAYSXXI-4A	RWS9VXXX 3W		RNJOBXXXI- 4/F 12W		RBIGHERWY 1- E	Pipus 35EC 250MA	0PDT, 3A	SPST 4A	S.
Consecuted Imparted Speciality		SUBSYSTEM: EQUIPMENT:	DEVICE IDI	(COMENCLATUNE)	REACTUR	VOLTMETER	RESISTOR FIXE		d "	n	" "	11 Variabit	" "	- tiked	" "	" "	n	" "	SWITCH, ROTARY, NOW-SHOOT	" PUSHBUTTON	706615	
1	··	SYSTEM:	TYDEX	LUMBEN.							135											

INTIBILITY AND PRISH TO SISTING BILL TO THE SI

SUDASSEMBLY:		BEMARKS	2/2	5	9	11	-	11		=	11	1		=			MT8F= 18,500 AR
ASSEMBLY:		Ϋ́я	. 27.	0,	0.0	0.0	0.384	1.13	30.4	4:0	4.9	4.8	0.92	81'			4.50.45
-		RATEN	175	01	o o	1.0	. 06K	0.56	1.6	77	1.6	9:1	74.	.68			-
UIIT: 17 INTFREGUNNECT BOX		N N	`	,	5	9	V	М	6/	4	3	8	R	`			SUM OF N Xe
GROUP:	DEVICE IDENTIFICATION	number	h198N1					MS 3110 K 22-215(4)	214		2.6	ZSMA	0.5-3A	201			
SUBSYSTEM: EQUIPMENT:	DEVICE IDE	HOMENCLATURE	DIODE	CHINP INCHIONSCENT	LAMP, NEON	×15€	FILTER RFZ	CONNECTOR	RELAY, GPST	" GP 420T	" , 5?	GF SPST	SWITCH PUSH SPST	SWITCH, TOGGLE, DP		·	
SYSTEM: WLR-16	INDEX	เบพระก							136					**			

Description of the service of the se

SUBASSEMBLY: SHEET 1		REMARKS	82								NA STATE OF			
		Y.Y.	11.19	15,52_ "						-			+	
ASSEMBLY:		RATEX	11,12	15,52							-	-	+	
UNIT: 20 C7-251810		N	-	-								·		
T: GROUP: UNIT: 2.0 ASSEMBLY CY-2.518 &	FICATION	иомоев	20 A1	20 A 2										
SUBSYSTEM: EQUIPMEN	DEVICE IDENTIFICATI	NOMENCLATUNE	CAEINET ASSY.	CABINET ASST.										
SYSTEM:	N30KI	บะเจยิก	O		R								10	

	OATE 11 12178	SUBASSEMBLY:	SY SHEET OF		REMARKS	SZ.		=	1										
	1.	ASSEMBLY: A1	CABINET ASSY		Ϋ́	وَ	2,2	4.4	.sc				100	100			STANSON N		11.12
	ORKSINE	ASSE		2011 1102	RATEX	4	-:	1:1	,56										
0	HE YSIS'W	1: 20	CY-2518B	OHA-THE	N	4	4	G	-							300		101	SUM OF 4 X+
	INHERENI RELIABILLI TANAL PSIS WORKS LIET	INT: GROUP: UNIT:		DEVICE IDENTIFICATION	NUMBER	CKTOAWIOZM	U6-5568/U	-90	15 GOV										15
	· · · · · · · · · · · · · · · · · · ·	SUBSYSTEM: EQUIPMENT:		DEVICE IDE	HOMENCLATUNE	CAPACITOR, CERM.	CONNECTOR 1CAX.	CONNECTOR, COAX.	CONVECTOR, GANEL										
I	- -	SYSTEM:	18-18	MOEX	บหอยก						13	9							

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WITH THE THE THE THE THE THE TOTAL PSISTINGENT THE TANK THE THE THE

GROUP: UNIT: 20 ASSEMBLY: 42 SUBASSEMBLY:	CY-2518B CABINET ASST	משאיוודא באורטופ איי	M HAIEA	AW102M 19 .44 8:36 Ns	5568/U 3 1.1 3.3 "	3 1,1	17.5. 1 .S.C.							
EQUIPMENT: GROUP:		DEVICE IDENTIFICATION	NED	CK70	06-	SNC UG-88/U (2)						A TRANSPORT OF THE PROPERTY OF		
SYSIEM: SUBSYSTEM:	WLR-16	Moex	OLY THE WORLD	CAPACITOR	CONNECTOR ,	CONNECTOR	CENNECTOR							

	11:		REMARKS	2	11						804				NYTRE 44,964 1:RS.
0	ופרא:		ζN.	11.12	4111										22,24
ORKS, LE	ASSEMBLY:	FAILURE	RATEX	11,12	11,12										
יאב לאני	Utalt: 21	OUA:TITY	N	-	-										SUM OF N Xe
TWHEREIN'S RELIGIBLE TO ANDER PSISTING RISTINGET TO	Gnoup:	DEVICE IDENTIFICATION	NUMBER	2141	21 42										
	EQUIPMENT:	DEVICE 10	Tune	ASS7.	ASSY.								100	2,5,610.8	
0	SUBSYSTEM:		ROMENCLATUNE	CABINET	CABINET					The second secon		Section Sectio			
1	SASTEM: NLR-16	INDEX	W. OE. R			O I PO		141							

SHEET - OF 11/2/18 REMARKS ASSEMBLY: A2 | SUBASSEMBLY: DATE Ns = = = CABINET ASSA. らら 7.7 156 2,2 11,12 INHEREINT RELIABILITY ANAL YSIS WORKS LIETT XN. FAILURE 44, .56 = = C7-2519 QUA:TITY SILL OF WAY UNIT: 21 4 4 4 SOOVAC PLSTE ISA MAX CKTOAN 102 M 0/8755-90 NUMBER 0/88-90 GROUP: T.3506. S CONT. DEVICE IDENTIFICATION EQUIPMENT: CONNECTOR PACK + BAC. CAPACITOR I CERM. CONFICTOR, COAX. ROMENCLATURE CONNECTOR! Parametric SUBSYSTEM 01-37 INDEX I.U.: BEN SYSTEM 143

INTERENT RELIABILITY ANALYSISTORISTICETTO

SUDASSEMBLY:	SHEET TOE		REMARKS	Ns	11										WT8F = 40193 HRS.
			ζN.	13.7L N				1		18.10					24.88
ASSEMBLY:	A	CALLIDE	RATEX	13,76 1	11.12 1										124
UNIT: 22	CY-2544D	OHA-THE	N)											SUM OF 9 Xe
GROUP:		DEVICE IDENTIFICATION	เขตอล	22A1	22.A2									POLITICAL	CALIBRATON LAWRENCE
EQUIPMENT:		DEVICE IDEA	unë :	ASSY.	ASSY.						3 (SA) (SA)	C 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	423000		
SUBSYSTEM:			NOMENCLATUNE	CABINET	CHRINET										
SYSTEM:	121R-16	INDEX	Kükisen	5	Ū			14	4						

SHEET REMARKS SUBASSEMBLY: DATE 52 = -= CY-2544B CABINET ASST 8,80 4.4 ルル ASSEMBLY: A 1 .56 X .. 1001 LUMERENI RELIMBILLI TANAL YSIS WORKS LIET RATEX 4 .56 -= OUA:TITY N שווד: 22 4 2 4 15 COUT. SOOVAC CK 20 AWIOZ M 0/3 755- BO NUKBER 06-98/0 GROUP: DEVICE IDENTIFICATION EQUIPMENT: BYC CONX PARK PIXED CERM. CORX NOMENCLATURE CONTECTOR. GUNECTUR SUBSYSTEM: CAPACITOR Sex Metson ELR-IP RUMBEN ... CYSTEM:

ASSEMBLY: A2_ SUDASSEMBLY: 2 = = CY-2544D CABINET ASSY. 6:16 4,4 SC 7,7 X. INHERENT RELIABILITY ANAL YSISTNORKS LEET AUNTITY FAILURE + 125 Ξ 1.1 UNIT: 22 4 4 4 ISA MAX. CKTORDIOZM 08-586 E/U 15 cont. 500 NAC. PLATC. INSUL. 15A NUKBER GROUP: 0182-00 DEVICE IDENTIFICATION EQUIPMENT: CAPACITOR FIXED PACK + CONNECTOR, CONX. P. N.C. NOMENCLATURE SUBSYSTEM Constaction Germenas のととろろ LUNDEN SYSTEM: 146

SHEET A SE こと ひと こ ノンイン REMATKS SUCASSEMBLY: NA = = 9866 7366 4.4 00000 XI. ASSEMBLY: Indentive RELIMBILL TANAL TSIS WORKS LEET 1986,9 9.986 FAILURE = CY-4455 QUA:TITY N UNIT: 23 4 NUMBER GROUP: US-1125AV 4 2342 2341 DEVICE IDENTIFICATION EQUIPMENT: CHELE ASSEMBLY ATSE MELY CONFLICTOR , COAX, NOMENCLATUNE SUBSYSTEM: CARLE といろしる LUNGEN . SYSTEM 147

BEMARKS DATE 11/ SUBASSEMBLY: 2 = C7-4455 CASUE ASSY. 5.72 ASSEMBLY: A1 770: 2.2 88. ピニ XI. 10001 INHERENT RELIABILITY ANAL YSIS WORKSHILETY FAILUNE RATE X 990. .44 4. 36 -: QUA:TITY N 13 d 4 N 7.54 MAX OIOS AMP. CK724×102m CK10AW102M NUMBER 0/8955-90 ISA GROUP: BOOME 20 CONT. DEVICE IDENTIFICATION EQUIPMENT: PACK AL FIXED CFRM. CONFICTOR , COAX. NOMENCLATURE SON DECTOR, FILTER , RF SUBSYSTEM: CAPACITOR C ローとろろ LUTTER SYSTEM 148

MANAGEMENT OF THE PROPERTY OF		DATE 11/2/178	SUBASSEMBLY:	SHEET _ CE		REMARKS	NS NS	2	11	11									
		· · · · L	ASSEMBLY: A2	CABLE ASSY.		Υ υ.	5,12	80.	990.	4.6	1.12								1400
	0	, ORKS, LE	ASSEL			RATEX	44	4	190'	1.1	38.								
		YSIS.	UNIT: 23	Ct- 4455	ALT: VIIO	Z	13	4		4	Ч						•		
and the second s		INHERENT RELIABILITY ANAL YSIS WURKSINET	GROUP:		DEVICE IDENTIFICATION	иомоев	CKTOAWNOZM	724×102W	300/DC DIOS AND	06-556B/v	6 cout, 15A MAX.					17400			
			SUESYSTEM: EQUIPMENT:		DEVICE IDEN	KOMENCLATUNE	CAPACITOR, FIXED	-11	FLITTER RF	BUNECTOR, COAX.	CONTRACTOR PRIME								
AND WHITE SECURITIES AND SECURITIES		- - j.	SYSTEM	NR-13		หับสอยก						- 14	19						

INHERENT RELIABILITY ANALYSIS WORKSHEET

1) 2/ (1)	SHEET TO SE	-	REMARKS			•							1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			20.1 10 . DC
SUBASSEMBLY:				20	2	II								A STATE OF THE STA		,
ASSEMBLY:			ζĸ	4	7866	10,866 10,866							1.50			20000
	.9		RATEX	1,1	986'6	10,866										+
UNIT: 24	CY-4456	7110	A' N	4	-	-										1
GNOUP:	0	TIFICATION	иомоев	UG-1185A/U	24A1	24A2										
SUDSYSTEM: EGUIPMENT:	10	DEVICE IDENTIFICAT	NOMENCLATUNE	CONNECTURY, COAX,	CABLE ASSEMBLY	CARIE ASSEMBLY						*				
SYSTEM:	MLR-10	LIDEX	เกรเลย					16	•							-

SHEET REMARKS SUBASSEMBLY: 20 = = = = ASSY. 5,72 9901 ASSEMBLY: A1 800 7.5 2,2 YH. 1000 INHERENT RELIABILITY ANAL PSISTNORKS LETT CM-4456 CABLE FAILURE 44 4. 1901 , SY -: OUA:TITY N 47 3 4 4 4 UNIT: 7.54 max. 300 VDC DIOS AMP, ISA CK12AX 102 m NUMBER CKTOANIOZM UG-55681 GROUP: 20 cout. DEVICE IDENTIFICATION EQUIPMENT: FIXE & PACK + CONVECTOR, COAX, ROWENCLATURE SUBSYSTEM: FICTER , REF CONNECTER! CAPACITOR = 5-10-10 SYSTEM 151

STATE OF THE PARTY

SHEET LCF DATE 11/3/78 REMARKS SUZASSEMBLY: 50 = = 1557 ASSEMBLY: A2 1.60 1001 1000 2,2 7. X. 200 INHERENT RELIGILATE AND PSISTIORIST CABLE FAILUNE 990. .56 4. 44 = CY-4486 QUA'TITY N UNIT: 24 N N 4 6 ODS AMP. CONT. ISA WAX. CK 72AXIOZM UG-556B/U CK70AW102m NUMBER GROUP: DEVICE IDENTIFICATION EQUIPMENT: PACKY COAX FIXE V NOMENCLATUNE 打工玩, 你 SALTE TOR からかんとう CAPACITOR SUBSYSTEM ローとう ..U. DEA SYSTEM 152

	DATE 1.13 /2	>	ST T LESING			Ns	11	1	11		1			The second secon		BE AND SA		אחדצה - היה כפנ וומר
	13	ASSEMBLY:			ζu.	1.0	16,72	310,	8,8	SiS	42.2					9		-1cc FF
	WORKSINE	ASSE	27		RATEX	1:0	4.	10.	111	1.1	95.							†
	* r rsis	UNIT: 25	CY-2522-12	Olla-FILE	N N	-	38	-	o	S	0							,,
	harterent Reliability ANALYSIS WORKSHET	GNOUP:		NTIFICATION	מטאום היא)	11SVAC LOOKE	CK70AWIOZW	CPS3BIFF205K	75~ 15004AC RMs (3) UG-SS6B/U (5)	50 - SIMBLE - COS	1 1 20							· ·
		SUDSYSTEM: EQUIPMENT:	ים	DEVICE IDENTIFICATI	HOMENCLATUNÈ	MOTOR, BLOWER AC	CAPACITOR , CHAM.	CAPACITUR, PAPTE	CONNECTOR, GAXI	CONNECTOR, COAX,	COLDECTOR , PARTIC							
01]	2787EU	3	X DOEX	"CONDEA						15	3						

7. SHEET		REMARKS												
SUBASSEMBLY:			2	٤	-1								200000000000000000000000000000000000000	
ASSEMOLY:		ረ ክ.	17.784		1.5									
	FAILTIRE	RATEN	8.892	1	.75									
UNIT: 28 RADIO FREG TRAISMISSON	DUATIT	N	7	0	7									
Gnoup:	DEVICE IDENTIFICATION	ทบพอยค	OPERATED POSITIONS)	CF RE SWITCH)	113514				0.8188.80	2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	CHILD WITH THE			
SUBSYSTEM:	DEVICE 1DE	HOMENCLATUNE	SWITCH, RE (4 RELAT	CONN COAX (PAK- L	DISOE		•							
SYSTEM: IVER-1G	MEEX	1.3E.N	1	1	7	-								

DATE 19/33/78	SUBASSEMBLY: SHEET CF	REMARKS	22	•								CONTROL AV	MTBF = 138,889 4RT.
0 2	aLY:	Ų.	7.2							2			7.2
ANAL YSIS' WURKS, LET'	ASSEMBLY:	FAILURE	3.6										
PAL PSIST	UNIT: 29 KANSO FREED, TRANSANSSION	QUA:TITY N	લ									-	SUM OF N Xe
INTERÈNI RELIABILLI I	GnouP:	HOREX LUMBER HOMENCLATURE NUMBER	RELNY ROTHRY COAX, SPLT			155					DZAKSE STATESTICK STAT		i Co

DATE 10/30/78	SHEET LOF		'NA REMARKS	2	_	11 48	11				A Comment of the Comm					
Accement.		-	FAILUNE N		4.446 4.446	-	-									
UNIT: 27 ASSEMBLY	h		CUATITY		`	N	વ							-		
GROUP:			исмоев	UF RE SWITCH)	Reiny	OPERATED POSTIONS)	419EN1								4	
SUBSYSTEM: EDUIPMENT:		DEVICE IDENTIFICATION	HOMENCLATUNE	CONN. CORX (PACT	SWITCH, RF (2 SPOT A	SWITCH, RE (4 RELAY O	DIODE					0 8				
SYSTEM	WLR-16	XEDMI	"CLL						156	概		9	+			

	DATE 11/11/18			BEMARKS	200	=	11	=	1	=	1,	-	2	1. 2 360.30	¥	,	TI SERVICE II	1			11	
Townson A	19	ASSEMOLY:		ζn.	70,8	2.119	00-	.132	8.936	31,2	6,0	132	20	240.3	21.27	4,948	4,007	172	78	2.54	6.0	
	, wgRKSi.e	ASSE		RATEX	70.0	2,119	60.	790.	4.468	2.6	2,0	190,	20	34.4	1,27	1,237	4.007	98	38	1,27	09.	
	AL YSIS	Ë		N N		-	7	7	2	12	3	4	-	7		4	_	2	-	4	0	
	INHEREIN! RELIABILLIT ANAL YSIS WORKS LEET	AENT: GROUP: UNIT:	DEVICE IDENTIFICATION	CTC) NUMBER (277)	-	TRANSIM IT	MI	TYPE FL53BDIEA PER MIL-F-15733D	15¢, 1500		MS-3112E-20-16PW(1)	HACT TO ANSTORAGED TO THE TOTAL OF THE TOTAL					FIBRE CABLE, NEOTREME TEETH, NYLON FACING	WE C'RES STELL	CRES STEFIL			
Contract Consent Contract Contr		SUBSYSTEM: EQUIPMENT:	DEVICE ID	HOMENCLATUNE	MOTOR , SPLIT PHASE	SYNCHRO GENERATOR	CAPACITOR, PAPER	FILTER	NEATER	CONNECTOR , COAX.	CONNECTUR, CIRC.	The retor , ASS.	S. WELLES	BUTARING, BALL	BARCHET PULLEY ASST.	SHAFT, C'RIN STELL	TIMING BEILT	GEAR, SPUR	SPUR. SPUR	PULCEY	BRSKE : RUPRER	
Council Council	- - - 	SYSTEM: AS-899 F	INDEX	เนพอยน						15:	, _											

TANG SHEET 2 OF CORP. EM SYSTIEMS MICPOPHASE DATE LITELY REMARKS SUBASSEMBLY: LCTS 3 = : = = LUVUL 4,0 トア 2,0 XX. ٥ 3.6 hundenein Retinable to ANAL YSIS WORKS INET ASSEMBLY: FAILUNE 4,0 .60 2,9 9:6 9,6 QUA:TITY 4 UNIT: DIFF, +30-±5-BI-METAL ELEMENT MS35039-22 NUMBER GROUP: NOFF #5. DEVICE IDENTIFICATION SUTTER THERMOSTATIC ASS7 SPIRAL SWITCH , TOGGLE NOMENCLATURE MULTIPLEXER SUBSYSTEM: 0-8126 ASTITISA AC-299F . INDEX SYSTEM 158

	DATE 11/2/19	JLY:	Jaker CF.		HEMAHKS	82	11	=	ا، رو مدر مادر (م)		1	- CP	11 05,64+ (1)	1	1,	1,		Epotenda.		Population (PA)	- Bress	(C) s = max
	ET	ASSEMBLY:		ζη.		755.55	2,119	2,544	30.40	1	1	1010	οĶ	5.0	16.	,0048	1,00	-	.80		1'1	132
	ANAL YSIS WORKS WET	ASSE		Y FAILURE	RATE	55.55k	2.119	2.644	3,8	1	1	10.	2,5	2,5	16.	,0048	01.	1	.20	1,00	1.1	990.
1	, h. rsis	UNIT:		- auantity	2	-	-	-	8	1	1	-	7	7	-	1	01	1	4	1.3	-	7
	hurdenèn' RELIMBILLI A	GROUP:		1	NUMBER (6	12.64 OUT 0.484 RATIO			2,5mf =	250mf 154BC (1)	· 200mf 15v loc (1)	4700pf Boovec	· AN 10277	1.093		LOTH EPO	15 AMP. 2504 (4)	4 AMP. 250V (4)	NE-51	328	0/18	30mh 5002 RMS(1) (1)
		STEM: EQUIPMENT:		SOUTA ISNOW		RESOLVER, ELEC.	STACHED REC.	SYNCHRO, TRANSFORMER	CAPACITOR, ELECTRO,		1	CAPACITOR, PAPER	DIODE, GERM.	DIODE , GERM.	DIODE, SEIGN	P.C. BOARD	FUSE, CARTRIDGE		LAMP, NEON	LAMP INCAD.	CONNECTOR, COAX.	COIL, RT
].	SYSTEM		LUMBEN					I'm more of		159											

INHERENT RELIABILITY ANALYSISTICETY

SUBSYSTEM: EQUIPMENT: G		15	GROUP: UR	UNIT:	ASSE	ASSEMBLY:	SUBASSEMBLY:	18
				٠				SHEET 2. CF.
DEVICE IDENTIFICATION	HTIFICATION			2	1			
		35	HUMBER (BTY)	2	RATEN	ŲΝ.	REMARKS	XX.
RELAY, THERMAL ISAMP MAX	6	72	HSLAC OR PLASLEC	-	74C	245.	u 2	
27.62	2972			_	.234			
, PINIOD STAIDLESS	STAINLESS	O	STEEL	-	1236	.236	=	
SPUR ALVMINUM	ALVMINUM	4		_	.236	325.	=	
GEAR, SHAFT ASSY, ALUMINUM	ALUMINUM	3		-	.236	,236	2	
PHOSPHOR			BRONZE	-	.540	.840	11	
PHOTO- BIODE SILICON	512125 1N2175	3		_	16.	16.	=	20,187
TRANSISTUR, DAN 2035	2235		6.7	e	0,0	\$4,0	=	
RESISTOR, COMP. ROZOGF812K	RC206F222k RC206F822	22	(S) (S)	25	,039	5175.	. =	
RC20 8F 472K	RC20 OF 4721 RC20 OF 1021	त ती	, ,		1	1		
RC20 8F 192K RC 20 GF 122K	- 1	位为	(5)		1	1	÷	
RC 20GF 332K RC 20GF S62K	RC 20GF 332K RC 20GF 562K	7 4	(3))	1	1	-	
RC 208F 682K RC 208F 103 K	RC 206F 682K RC 206F 103K	3 K	(3)	1		I	=	
RC20 6F 221K	BFE GET	SK K	(1)	1		1	-	~
RC30BF 103K	100	4 2 4	(2) (3)	.)	1	1		9
	32 254	2		-	7,5	7,5	4 & =	
RESISTOR, CONT., RUA ATSD103 A	RV4 ATSD10	9 9	3A (1)	0	22,0	198,0	£	
						-		

					ľ	
SYSTEM.	SUDSYSTEM: EDU	EQUIPMENT: GROUP: LUNIT: LONG CONT.	ANAL YSIS	W.GRKS.	SingeT's	34/5/11 3/7E
C-3118						SHEET 3 CF
VEGENOU.	NOMENCLATURE	DEVICE IDENTIFICATION HUMBER	OUA:TITY	Y FAILURE RATE X	YN.	REMARKS
		RYBLAYSAIOZE (1)	1		1	
	SWITCH SENSITIVE	SPET, LOAMP, 125.	3	=	67.10	
		10 AMP. 1254 (4	1	1	1	11
	SWITCH, TEGGLE	11 1	-	3.	29'	
	TRAISFORMER PUR	1154 60HZ	-	,0,4	,064	11
161	TRAINET OR WERE, PULSE	Sood PRI. 15H SER	-	, 00%3	,0083	1
						THE STATE OF
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	G		ŀ			widering the second sec
					-	
					DVI OFF	TABLE DOOL HOS

SHEET L CF REMARKS 1112 1.9c MTRITE Ns = = : 83,127 83,127 1,594 1,594 1,610 1,610 22,34 27,34 THEREIN' RELIABILITY ANAL YSISTAGRICETT XX. ASSEMBLY: FAILURE OUANTITY N UNIT: NUKBER DEVICE IDENTIFICATION 1A4 1A2 1 A3 A EQUIPMENT: AMP, PLUR. SUPPLY ASSY. ASSY, NOMENCLATUNE ASSY. ASSX. SUBSYSTEM: PIODE BIODE DIODE AM-1017B LUNGEX LUNGEN SYSTE 162

	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SUBASSEMBLY:		REMARKS	Ns Ns	=	-		-		2		-11	1		1	1	11	1	1	1	
	TE	ASSEMBLY: A1	AMIT, - PLAK. SOF	YN.	10.	6,00	16.	9,50	1	1	3,3	1.2	4.4	2.2	.1155	1	1	1	44.0	8,6	1,29	
	"URKS"	ASSE	7	FAILURE BATE A	16.	37.	18.	6-	1	1	=======================================	1.7	1-1	1:1	2700.	1	1	1.	22.0	8.6	.43	
	VAL YSIS	UNIT:	-	OUA:TITY N	-	O ^o	-	5	1	1	W	-	4	14	(5		1	!	.4	-	M	
	INHERENT RELIGBILLT ANALYSIST WORKS INTET	GROUP:	DEVICE IDENTIFICATION	HUMBER (QTY)	INGLAB	INSGO	12030B	CLSICHSSOMPS (1)	CL25 BG 36 0 SP3 (1)	CL25BL1017P3 (1)	27222A	2N2907	21657	223902	ROR 206F 1833 (4)	RCR 208F223 J (1)	RCR 2007 333K (1) RCR 206F 1223 (3)	RCR 208F 222K (1)	6	RK09 UACS102	RWSSV882 (1)	
		17 B EQUIPMENT: EQUIPMENT:	DEVICE 106	NOMENCLATUNE	DIODE SILICON	DIODE SILICON	DIODE , SILIGO	CAPACITOR, FLECTRO.			JEANSISTOR, NPN	TRANCISTOR SILICON	RANSISTOR, NAN	TRANSISTER NAMED	RESISTOR , COMP.				RESISTOR, LAR.	RESISTOR, LAR.	REJISTOR, FINED	
I	- J _.	SYSTEM: AM-1017 B	NOE'S	. เบเลย						163												_

SHEET 2 3F REMARKS SUBASSEMBLY: 2 : : AMP, -PWR, SUPP. .064 .078 90. ASSEMBLY: A1 INHEREINI RELIABILLI Y ANAL YSISTNORKSINGETT ₹. 10120 FAILUNE ,039 ,004 .03 QUA:TITY N 4 4 UNIT: TFSRXO3ZZZ + 320V CT 33 RASSB 4322F RC 426F 681 J RC 426F 152K RN 55 1003 F NUMBER GROUP: DEVICE IDENTIFICATION EQUIPMENT: TRANSPORMER, PWR. FILM RESISTOR , COMP. NOMENCLATURE SUBSYSTEM: PESISTOR, AM-1017B Anada NOEX RUTTOEN SYSTEM:

1	SUBASSEMBLY: SHEET 1 3F		REMARKS	Ns	-							25 MA WATE	ANDWESSIEDE	September 1970		
		ST ASSY.	ζn.	1,5	10,	,078									_	
ORKS ref	ASSEMBLY:		RATEN	ST,	10.	950.										-
WAL YSIS'	UNIT:		N N	4	-	7										
INHERENT RELIMBILITY ANDLYSIST WORKS INTETT		TIFICATION	NUMBER	IN1204A	CPS3B4EF105VI	RC326F104K					3400000					
	SUDSYSTEM: EQUIPMENT:	DEVICE IDENTIFICATION	NOMENCLATUNĖ	DIODE, PECTIFIER	CAPACITUR, PAPITE	RESISTOR, COMP.					10 7 10 10 10 10 10 10 10 10 10 10 10 10 10	THE STATE OF THE S				
	SYSTEM: AW-1017B	MOEX	เลียนาว.					165								

SUDASSEMBLY: SHEET _ CF		REMARKS	1	<u> </u>	1						0.300			
BLY: 143		ΥN.	1.8	.032	810,					D.		8	+	
ASSEMBLY:	1	RATEX	:75	910.	,039		1							
บผาร:	OHANTIN	N	И	53	Ч					1		-	- -	-
Gnoup:	DEVICE IDENTIFICATION	NUMBER	101204A	CPS384EF105VI (CPS384EF1504VI	RC326F104K									
SUBSYSTEM:	DEVICE IDE	HOMENCLATUNE	DIODE STETIFIER	CAPACITOR, PAPER	RESISTOR , COMP.						•			
SYSTEM: AWA-1017B	x30th.	הטאימבת												

I	סאדה "וו"ן בולוז "	3LY:	SHEET TOP		REMARKS		BLOWER USE	1 3										25.00 A M 25.00	STATE OF THE PERSONS ASSESSMENT ASSESSMENT OF THE PERSONS ASSESSMENT ASSESSMENT ASSESSMENT ASSESSMENT ASSESSMENT ASSESSMENT ASSESSMENT ASSESSMENT AS	
П		1	<u>×</u>	_		20	=	1	ŧ	-		-	=	=	٤	-	11			
	ET 4 .	ASSEMBLY: A 4	DORE ASSY.		YN.	3,00	0.1	. 144	500	110	140	5,5	.256	1.72	89,	3,3	.064	APA		27214
	T. ANAL YSIS WORKS LILET	ASSE	Ä	_	RATEX	.75	11	910,	01.	01.001	,20	5,8	.004	.43	89.	1'1	,064			
	, rsish			OHA-FILE	N	4	_	٥	4	,	2	-	4	4		3	_			
	harleren retikalli r'An	NT: GROUP: UNIT:		DEVICE IDENTIFICATION	NUMBER (QTY)	123190		CP70BIEF10SX (1) 15mf + 20% 600VBCD (8)	3AC 1A 2504	ONE ISA 2504 FUSE +	NE-51	151	115 VAC 6A INPOT, LOADS SON	06142	DPST, SA, 125V	SPDT ISA, 125V PUSH BUTTON TYPE	INSUAC ENPOT INULT, SEC.	830808		
Production of the Control of the Con		SUBSYSTEM: EDUIPMENT:	118	DEVICE IDE	HOMENCLATURE	DIODE , RECTIFIED	MOTOR, AC	CAPPLITOR, PAPER	FUSE	FUSE, INDICATING	LI,MP, NEON	RELAY	REACTOR, SATURABLE	PRISTON, LIKE	SWITCH TOGGLE	SWITCH , SENTINE	TRANSFORMER PUR.			
1		SYSTEM:	Kin-10178	130EX	KUKBEN				4		. 16	7								

101 SHEET 1041 1105. SUBASSEMBLY: REMARKS 1' ロントン っつ 73,112 323788 960.950 X. ASSEMBLY: INTERENT HELIABILLIT ANAL PSISTNORKSINETT 73,112 388788 FAILURE GUAVIITY N UNIT: NUMBER GROUP: 4 トラつ トラつ DEVICE IDENTIFICATION EQUIPMENT: JOHNTOL INDICATOR AUSK NOMENCLATURE SUBSYSTEM: AMPLIFIER AN/WLA-3B 100 pm INDEX LUNCEN NO WATER

Number Subsystem: EQUIPMENT: Lands: La	ovre "Ilalys"	SUDASSEMBLY: SHEET 1 DF.		REMARKS	2/2	Ξ	11	-	Ξ	1	2	1	5	li li		1		11	II BUREAU THE	II.
Number N		:אסרג:			3,80	3,00	22,0	01.	2,20	100.	10.0	==	22.0	2002	1	6.80	29.	20.		
SUBSYSTEM: SUBSYSTEM: SUBSYSTEM: ROWERLATION SAITCH, TOCCIE WAS 102A12-145 SONT 115VAC 2.73 Cont. Resistor ROWERLATION ROWERLAT	, A BRAIN				3.8	.75	1,0	01.0	.56	990'	10,0	1'1	22.0	,039		1.2	89.	.064		
SUBSYSTEM: SUBSYSTEM: SUBSYSTEM: ROWERLATION SAITCH, TOCCIE WAS 102A12-145 SONT 115VAC 2.73 Cont. Resistor ROWERLATION ROWERLAT		7: 1 5-9993	DIANTIN	2	-	4	22	-	s	-	-	-	-	8	1	4	-	-		
SUBSYSTEM: J.A-3E CAPACITOR, EU LAMP, INCA EUSE CONNECTOR RESISTOR, V RESISTOR, V RESISTOR, V RESISTOR, V RESISTOR, V RESISTOR, V SUITCH, TOCCU TRANSTORMER, C	HERÈN' RELIMBILLI	Gnoup:	NTIFICATION			121614	-327		2A16 SIP (12. @ 15 0.4.0	2 2.70 9 HR.	2N1485	RVANAYSDSOOA	1		N .	25126	115VAC 28VAC		
		SUBSYSTEM:				DIODE	1	FUSE			METER	TRANSISTOR	VAR.	FIXED COMP.		-		, AUR.		

1 OF 1 DATE 11/2/19 SHEET REMARKS SU JASSEMBLY: No 356,460 356,460 88.459 88.459 356,460 356,460 86.459 86,459 XH. ASSEMBLY: INHEREN' RELIABILLI TANAL YSIS WORKS LEET AMP, ASSY, AMN-6:44/WA-3E AUATITY FAILURE UNIT: AM-6847/ Am-6846/ AM-6948 AM-6845/ NUMBER GROUP: DEVICE IDENTIFICATION 2 A3 2A4 242 24-EQUIPMENT: BANE 3 RF AMP. BANES 4 BANB 2 BANDI NOMENCLATURE SUBSYSTEM: ---RF AMF. RF AMP, AMP. 4N WLA-3B RF INDEX I.UR.DEA SYSTEM: 170

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Post Co.

diameter

SHEET - 3F 23 CDVH032 MICROPHASE REMARKS ASSEMBLY: 2A1 SUBASSEMBLY: DATE 2 = = = = = = -: = 17.0 018 4,999 2,0 13.0 AM-6845 17,0 2.029 8,151 22. 051 160 4,0 3 INHERENI RELIABILLIY ANALYSIS WORKSINET 2,717 FAILUNE 4.999 17,0 17.0 000 2,089 14.0 2,6 7.0 AMPLIFIER AM-6844 OUA:TITY N 3 M 4 UNIT: 1,0 - 2,6 GHZ, AVASTEK AS-1540 OR NJS-780-19 SPDT COAX. SWITCH, 3
COAY. COMMECTORS, ONE SPOT
MICRO SWITCH
RCA26F2713 (1) 1,0-2,6 GHZ 10MHZ VIDEO 84H-11 OR ELECTRONICS CORP. TALE PAOL, -LOO, LICENSTAN AMERICA EUSCIROINE LAB ALPHA IND. MT-3099-99 EE MS3102E28-21P NUMBER RC 426F151J GES, MICROMANE GROUP: 4102010 1103407 POLARAD 1223 DEVICE IDENTIFICATION EQUIPMENT: のナバナ市 CONTECTOR COAX. LIODE, MICRO. 2137 MINKO, DET LIMITER, COAX. CONNECTOR, CIRC. SETTER JOAK NOMENCLATUNE PUR 20 SOLD SUBSYSTEM: RESISTOR DIVINE BOOK DIODIA A2/24-38 LUNDEX LUNDEN SYSTEM 171

SHEET TOP CORP. CON324AE MICROPHASE REMARKS SUBASSEMBLY: DATE 2 Ξ = = = = = = = = ASSEMBLY: 2A2 RF AMP. #2 AM-6846 0,71 13,0 000 4.899 8,151 2,089 5.0 .22 INHERENT RELIABILLIT ANAL YSISTNORKSINETT 17.0 001 30 ZY. 4.0 17,0 FAILURE 4.999 000 2,0 17,0 から 2,089 4.0 2.717 -AMPLIFIER I AM-6844 QUANTITY N 5 3 d UNIT: AMERICAN ELECTROINE LAB SPET COAX, SWITCH 3
CAX, SOVESSONE SPOT 2,0 - 4,5 GHZ, AVANTER GED, MICROWAVE 864H-11 VIDEO BY, 100 - 10 PF LOAD POLARAD ELECTRONICS GRE 2.3-4.45 GHZ , 10MHZ AS-155N OR WJ-5090-7 MS3102=28-21P EE NUMBER 4102022 GEN, MICROWAVE RC+26F 2713 RC+26F 151 3 GROUP: MIC-3411 113407 123 DEVICE IDENTIFICATION EQUIPMENT: DIODE, MICRO, DET. ド別 STATE CONNECTOR, COAX CONNECTOR ICIAC. LIMITER, COAX, , PUR. MOMENCLATURE PENTOH OSAX. DIODE, MICRO, 2 5 SUDSYSTEM: 21705 RESISTOR BILIBER DIODE, AWA A5/214-38 No. of Contract of LUKBEN . SYSTEM Name of Street 172

SHEET - OF -Q40 SED +01 MICROFIATE CDV 3 48 AE REMARKS 12 BOND 3 ASSUMED ASSEMBLY: 243 SUBASSEMBLY: 2 = .-= = = RF AMP. #3 356.460 15118 24. 2,089 17,0 2,0 13,0 17.0 AM-6847 300 14.0 ₹. INHERENI RELIABILLI ANAL YSIS WORKS LEET FAILUNE 300 14.0 2,717 17.0 17.0 2.089 2,0 らい = AMPLIFIER AM-6844 GUA:TITY N S M 4 UNIT: 4.3-7.35 CHE, 10MHZ OR ALPHA IND. MT-3099-99 CORP. GEN, MICRONAVE 864H-11 POLAFAL ELECTPONICS TELEDYNE MEC M9152 SPET CAX, SVITCH 3
COAX, CANHICTORS, ONE
SPET MICRO- SWITCH MS 3102E28-21P EE NUMBER RC426F2715 GROUP: 3102146 23-3090 113407 1223 DEVICE IDENTIFICATION EQUIPMENT: 4-8 GHZ BIOBE MICKO, DE.T CONNECTUR, CIRC. DIODE, MICKO, DET. CONTECTOR, COAX DIVIDER , PUR. SUTOH, CAX. NOMENCLATURE AMA. BODE JAO SUDSYSTEM: 1 -KES IS TOR トスト AN WLA-38 TICEX TOTOER SYSTEM 173

INMERENT RELIABILITY ANAL YSISTIORKSILLETT

SUBASSEMBLY:	SHEET _ OF _		REMARKS	No	PSSUMED 1137			-	-	MICROPHASE CORP.	1	-					
ASSEMBLY: 2A4	RF AMP. #4		Ϋ́	308	17.0	0,7	13,0	151,3	.22	17.0	2,089	14.0					356 112
UNIT: 2 ASSEMBL			RATEN	3000	17,0	2,0	2.6	2,717	=:	17.0	2.089	(4,0					
4	AMPLIFIER AW-1944	100	A CO	-	_	-	S	M	7		_	_					1.
GROUP:	AW	DEVICE IDENTIFICATION	иомвея	MSIB2 OR LITTON M9162	123	MS3102F28-21P		SPET COAX, SWITCH 3 COAX, CONNECTURES, ONE SPET MICRO- SWITCH	6F2713 (1)	7.05-10,75 CUZ, 10MHZ	SIO2179 CARP.	GEN, MICROWAVE 864H-11					
SUBSYSTEM: EQUIPMENT:	-3B	DEVICE 10E1	NOMENCLATUNE	TWT AMP. 7-11 CHZ	DIODE, MICRO DET.	CONNECTOR, CIRE.	CONFECTOR, COAX.	SWITCH , COAX.	RESISTOR	DIODE, MICRO. DET.	DIVIDER, PUR.	DIODE, PIN	9				
SYSTEM:	A2/21A-3B	INDEX	หับหระก	,24				13 42,			N 17A						

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Lagrange

Santa C

PART CLASS: SWITCH

DESCRIPTION: STE PPING

FUNCTION:

ENVIRONMENT	FAILURE RATE Failures Per 10 ⁶	FAILURE RATE CO 90% In	NFIDENCE LIMITS terval
13490 7 5	Part-Hours (λ)	LOWER LIMIT	UPPER LIMIT
GROUND PORMANT	0.4	50 A 2000	090000
SHIPBOARD NAVAL «NELTELED	3.6	24-7	
		5,035.00	
*			

Multiplicative Application Factors for Environment

Environment:

Shipboard DORMANT
SHELTERED GROUND

Factor:

9.0 * 1.0

Failure Definition:

* FICTOR BASED ON MIL-HOBK-2173

PART CLASS: SWITCHES

DESCRIPTION: CORXIAL

FUNCTION:

FAILURE RATE Failures Per 10 ⁶	FAILURE RATE CON 90% Int	
Part-Hours (λ)	LOWER LIMIT	UPPER LIMIT
0.247		
2.717	2.8	
2.223		
	Failures Per 10 ⁶ Part-Hours (λ) 0.247 2.717	Failures Per 10 ⁶ Part-Hours (λ) 0.247 2.717

Multiplicative Application Factors for Environment

Environment:

Shipboard

Factor:

11 # 9 *

Failure Definition:

* FACTOR BASES ON MIL-HORK-217B RELAY ENVIRONMENTAL

PART CLASS: STACHEDS + RESOLVERS DESCRIPTION: STUCHED CONTROL TRAISFORMER FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval ENVIRONMENT Failures Per 106 Part-Hours (λ) LOWER LIMIT UPPER LIMIT 9.032 AIRCBORNE 2,644 * SHIPBOARD Multiplicative Application Factors for Environment Environment: Shipboard AIRFORDE 3.42 Factor: Failure Definition: * FACTURE BASED ON SYNCHRO CONTROL TRANSMITTER PATES , RADO - TR-75-22

PART CLASS: SYNCHROS + RESOLVERS

DESCRIPTION: SYNCHED RECEIVED TRANSPORT TELL

FUNCTION:

ENVIRONMENT	FAILURE RATE Failures Per 10 ⁶	FAILURE RATE CON 90% Int	
	Part-Hours (λ)	LOWER LIMIT	UPPER LIMIT
AIREORPE	7.246	10 m 10 m 10 m 10 m 10 m 10 m 10 m 10 m	B
SHIPBOARD	2,119 *	** x+8.5	

Multiplicative Application Factors for Environment

Environment:

Shipboard AIRBORNE

Factor:

3,42

Failure Definition: * FACTOR BASED ON SYNCHRA CONTROL

TRANSMITTER PATES, RADO - TR - 75-22

PART CLASS: SYNCHROS + RESOLVERS

DESCRIPTION: SYNCHED RECEIVED TRANSPORT TEN

FUNCTION:

ENVIRONMENT	FAILURE RATE Failures Per 10 ⁶	FAILURE RATE CON 90% Int	
2 FUSIL 1	Part-Hours (λ)	LOWER LIMIT	UPPER LIMIT
AIREOR DE SHIPBOARD	7.246		COLUMN TO THE PARTY OF THE PART

Multiplicative Application Factors for Environment

Environment:

Shipboard

AIRBORNE

Factor:

1 *

3,42

Failure Definition: * FACTOR BASED ON SYNCHRA CONTROL
TRANSMITTER RATES, RADO - TR - 75-22

PART CLASS: DESCRIPTION: IC VOLTAGE REGULATOR FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval ENVIRONMENT Failures Per 106 Part-Hours (X) LOWER LIMIT UPPER LIMIT SHIPBOARD 01103 × Multiplicative Application Factors for Environment Environment: Shipboard Factor: Failure Definition: BASED ON KN/SLQ-32 FAILURE PREDICTION BATH FOR SIMILIAR ITEMS

2A1A13-1R.1 845688-1 0,103 (V)3 REG, IC SIA-32

PART CLASS: DESCRIPTION: LIMITER FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval ENVIRONMENT Failures Per 106 Part-Hours (X) LOWER LIMIT UPPER LIMIT 4.999 * SHIPBOARD Multiplicative Application Factors for Environment Environment: Shipboard 1 Factor: Failure Definition: BASED ON ANSLO-32 FAILURE **PRIDICTION** SIMILIAR ITEMS 2AIAI3ARI 848471-1 4.999 (V)3

180

LIMITER, SLQ-32

PART CLASS: DESCRIPTION: POWER BIVIDER FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval ENVIRONMENT Failures Per 106 Part-Hours LOWER LIMIT (X) UPPER LIMIT SHIPBOARD 2.089 * Multiplicative Application Factors for Environment Environment: Shipboard 1 Factor: BASED ON ANSLA-32 FAILURE PREDICTION Failure Definition: DATA FOR SIMILIAR ITEMS

1A3A13A1 848368-1 1.788 (V)2, (V)3 PUR BIVIDERS
20A11A6 DC2-3 570935-2 2.389 ALL SUITES SLQ-32

PART CLASS: DESCRIPTION: THERMOSTATIC SWITCHES FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval **ENVIRONMENT** Failures Per 106 Part-Hours (X) LOWER LIMIT UPPER LIMIT SHIPBOARD , NS 0.40 2,80 SHIPBOARD, NU Multiplicative Application Factors for Environment Environment: Shipboard Ns SHIPBOARD . NA

Failure Definition: BASED ON MECHANICAL DESIGN AND SYSTEMS
HANDBOOK, TABLE 18.3. Nu OPPER EXTREME

Ns, LOWER EXTREME.

Factor:

PART CLASS: MECHADISMS, POWER TRANSMITTAL DESCRIPTION: PULLEY FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval **ENVIRONMENT** Failures Per 106 Part-Hours (λ) LOWER LIMIT UPPER LIMIT 1,27 GROUND SHIPBOARD, N. 1,27 GROUND, MOBILE 39,279 Multiplicative Application Factors for Environment na CROUNT, MOBILE Environment: Shipboard GROUND 1 31,02 Factor: Failure Definition: TRASED ON FADE-TR- 75-22 SHAFT ATA

MECHANISMS, POWER TRANSMITTAL PART CLASS: DESCRIPTION: SHAFT FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval ENVIRONMENT Failures Per 106 Part-Hours (λ) LOWER LIMIT UPPER LIMIT 1.237 CROUND SHIPBOARD , Na 1,237 * Multiplicative Application Factors for Environment Nm Environment: GROVAD Shipboard Factor: Failure Definition: BASED W

PART CLASS: MECHANISM, POWER TRANSMITTAL DESCRIPTION: FAX BELT FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval **ENVIRONMENT** Failures Per 106 Part-Hours (1) LOWER LIMIT UPPER LIMIT 4.007 GROVAD 4.001 * SHIPBOARD , N. Multiplicative Application Factors for Environment Nn Favironment: Shipboard GROUND Factor: Failure Definition: * BASED ON PAGE TR-75-22

HEATERS, ELECTRICAL PART CLASS: DESCRIPTION: CENERAL FUNCTION: FAILURE RATE FAILURE RATE CONFIDENCE LIMITS 90% Interval ENVIRONMENT Failures Per 106 Part-Hours (X) LOWER LIMIT UPPER LIMIT 4.468 GROUND, MOBILE 4.468 SHIPBOARD , Nm Multiplicative Application Factors for Environment Na Shipboard Environment: GROUND, MOBILE Factor: Failure Definition: * BASTED ON RABC-TR-75-22

Unique Component Failure Rate Estimate (cont.)

UNITS 6,7,8,9 A3 MIXER (WER-16)

STRIPLINE MICROWAVE STRUCTURE CONSISTING OF:

NEGLICIEUE 2 - 308 HYBRID COUPLERS

2×17 = 34 2 - MICROWNE DIODES (BALANCED MIXER CONFIG.)

* 4×13 42 1 - 2 STAGE TRANSIETOR AMP.

HEGLIGIELE 1 - 10 DB DIRECTIONAL COUPLER

1 x 13 = 13 1 - DIODE DETECTOR

89 ×10-6

From SECTION 3-70 WER-18 TECH.

MASUAL

* ASSUMED | TRANSISTOR & 2 DIODES

Unique Component Failure Rate Estimate

MTO-10/ \$ 102 MICROLINUE USCILLATUR

NIFE. BY TEXSCAN CORPURATION , BANDS 6+7

RELIABILITY MUDEL:

*2 × 13 = 26 /- Si MICROWAVE DETECTOR TRANSISTOR *

6 x . 13 = . 78 6 - Film Resistors RL

2x.066 = . 132 2 - RE Co./s

2x.25=.50 2- Freed through caps (assume cy Equiv.)

GT-101 + RCA S47671

MEG TEXSCAN

BANDS 849

1

1

RELIABILITY NIODEL

10 1- TUNED VARIABLE CAVITY
2.0 1- GA: FET +
2.10 ×10-6

^{*} ASSUMED | TRANSISTOR = 2 DIODES

^{\$} FROM W-3 780-19 BATA

Unique Component Failure Rate Estimate (cont.)

WJ 5090-7 Amplifier

Obsolete, replaced by Ga As FET

Estimated Reliability per Watkins Johnson

Appox. 100, 100 hours, 10x10-6 7

Consists of: 8 FETS

8 caps

4 diodes

8 resistors

WJ-780-19 Amp

1

Equivalent to 4 Ga As FET

Estimated Reliability per Watkins Johnson

125,000 hours, $\lambda = 8 \times 10^{-6}$

MT-3099-99 MICOWAVE SWITCH, ALPHA IND.

CONNECTOR & SWITCH

Estimated Reliability 70,000 hours per

Alpha Industries,

APPENDIX C

WLR-1G MAINTAINABILITY PREDICTION WORKSHEETS

NAINTAINABILITY ANALYSIS

1695 1677 391 13 13.6 75 32 138 19: 'n 7 2.27 224 3.91 3 6,51 6.5 6,5 iri Cr 6.5 CHECK-OUT 124 124 1.0 0.34 6.00 .124 124 Sheet Unit 00'0 AVERAGE MAINTENANCE TASK TIMES, HOURS , 103 0,134 0.00 1.75 0.134 0.00 000 0.00 ALIGN 1/10 1/1 0.134 0.34 0.134 480 103 0.134 RE-1/2 12 14 1.7 1/4 INTER-CHANGE 2.0 180 180' 1/10 2.0 M Assembly DIS-7360 160. 100% 160 160. 160. 1/4 160. . 094 1 TION TION 20 11 2 N 1.7 1/4 4/4 77 1.7 1/4 1.7 LOCAL-701 101. ,106 101 101' 101 N.A 101. 1/2 IZE Sul assembly 106 260.8 258 13 21.3 2.5 3 3/ Z. 1 :: 7.37.030-1-07.18 BELL ING/PILLEY BEL PELLACLABLE TIES COIN CIR CONI GAX INDUCTOR CALLIOR BEAKING SYNCHIO HEATER TINVE DULLEY FILTER Notor GEAR

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CICKLAND COLUMN

THE CATALL I WATER C-3118

MITHOD OF REPAIR: Replace-Fants X

Subassembly

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Assembly

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Sheet /

33.9 n; a, 2.650 401.3 8.43 565.6 74.70 43.9 1.5 211. 1.6 3 1 3.18 7.23 4.18 4.18 2.18 CHECK-12% 124 7 1/24 0.00 124 124 124 124 124 104 AVERAGE MAINTENANCE TASK TIMES, HOURS 0.00 TA Z 3.0 30 2.0 0000 200 60,0 0,00 0,00 ALIGN 0.8 2.0 11:0 1.03 183 034 15 150 1034 \$4 RE-188 1/4 1.0 .034 1.0 2 Sec . 125 18 1625 1/25 INTER-,125 ,305, CHANGE 5 18 1.0 12 10. Ź 2 de DIS-V80. 1.094 169% . 694 160 2.0 0.00 160. 24 110 1.0 160' 7 ISOLA-TION 1.7 0.00 * 1.7 2,5 2.5 1.7 1.7 1.7 1.7 LOCAL-IZE 90% 101 101 1/1 Z 200 101 701. 106 701 101 70/ 10% .0733 449. 55.5 13.5 .746 154 4.7 6,3 67.1 89 8.4 1.0 2 :: 0 4 7 CALLEY TOP DE DINTS SUITET SENSITIVE SUITCH TOGGLE TRANS FORMJER RESISTOR, UAK PLEIACLABLE TTER RESOLVER COUPLING SUNCHKO CAPACITOR GEAK PE/11/ DIODE FUSE

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161.42 407.19 a. E 4.87 15,55 7/185 5.9 1:1 100 CHECK-OUT 12% ys. Sheet Unit AVERAGE MAINTEHANCE TASK TIMES, HOURS 2.0 2.0 2.0 ALIGN 0.5 0.1 RE-20 125 DIS- INTER-ASSEM CHANGE .125 180. Assembly MAINTAINABILITE ANALYSIS 0.5 0.1 106 1.569 0.5 1.569 ISOLA-TION ,106 1.569 LOCAL-IZE 70/ Subasseml 1; 27.36 3.2 83.1 ENX 1/3.7 Ñ TITES AND 17/EX AN - 10178 4 = METHOD OF PEPAIR: Poplace-Farts DIODE ASSENIBLY ALESPE DIODE ASSELVE, AY AND AMP. PLUPSUP. 4 / PARTS REFLACEABLE TTER

ENS. 125/ n: C4 75.29 2176 . 1.03 ۳. ص 0; CHECK-OUT Unit AVERAGE MAINTENANCE TASK TIMES, HOURS Sheet ALIGN RE-INTER-CHANGE Lessembly. CENTRAL TOTAL TOTAL STREET DIS-ASSEM ISOLA-TION LOCAL-IZE Tube ssembly 381.8 67.5H 73.1 3 . :: × METHOD OF REPAIR: Perlace-Parts ASSEL BLY TOW AW WI 4-35 MILI TIEVE TYPE AMV. FIER B11.

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Subassem11y

Unit Sheet

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A111-6845 (321) Sub-ssembly X 1.112557 ITEX VIE - 36, Pr 12000 METHOD OF REPAIR: Replace-Parts

Assembly

Unit Sheet

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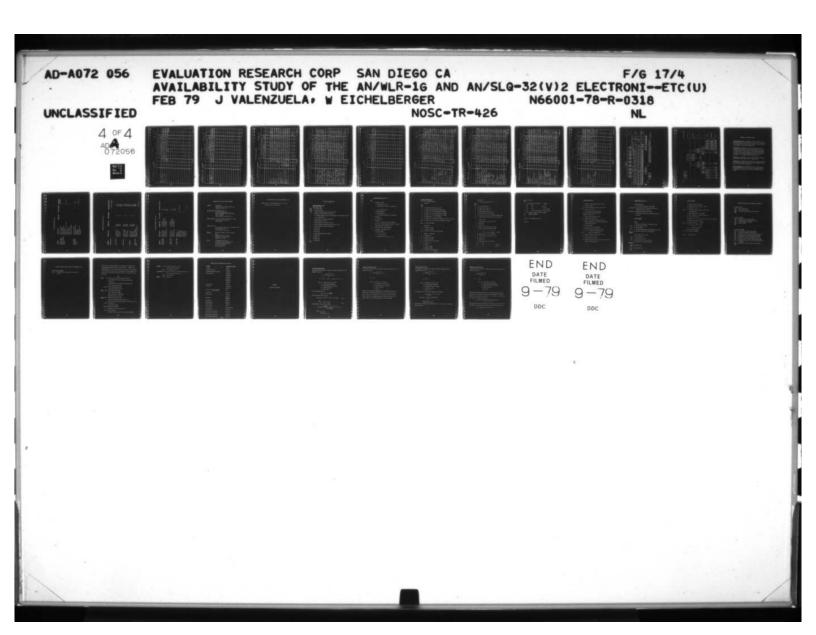
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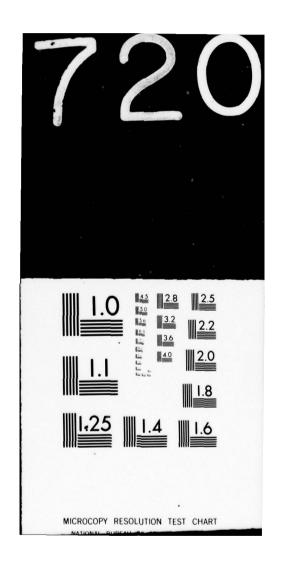
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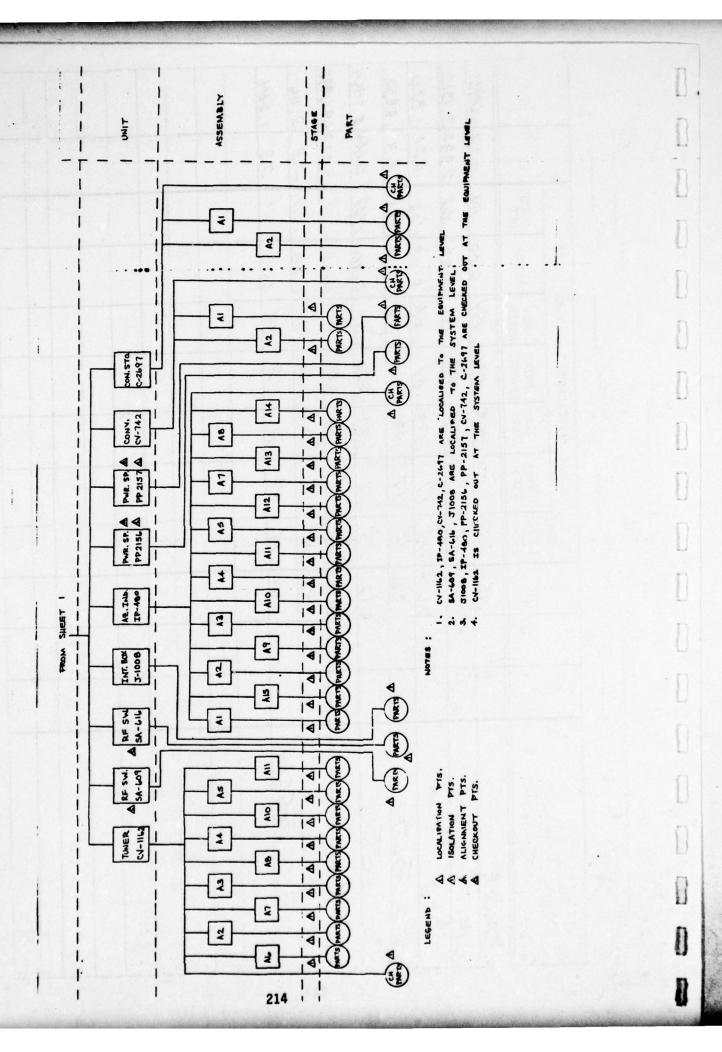
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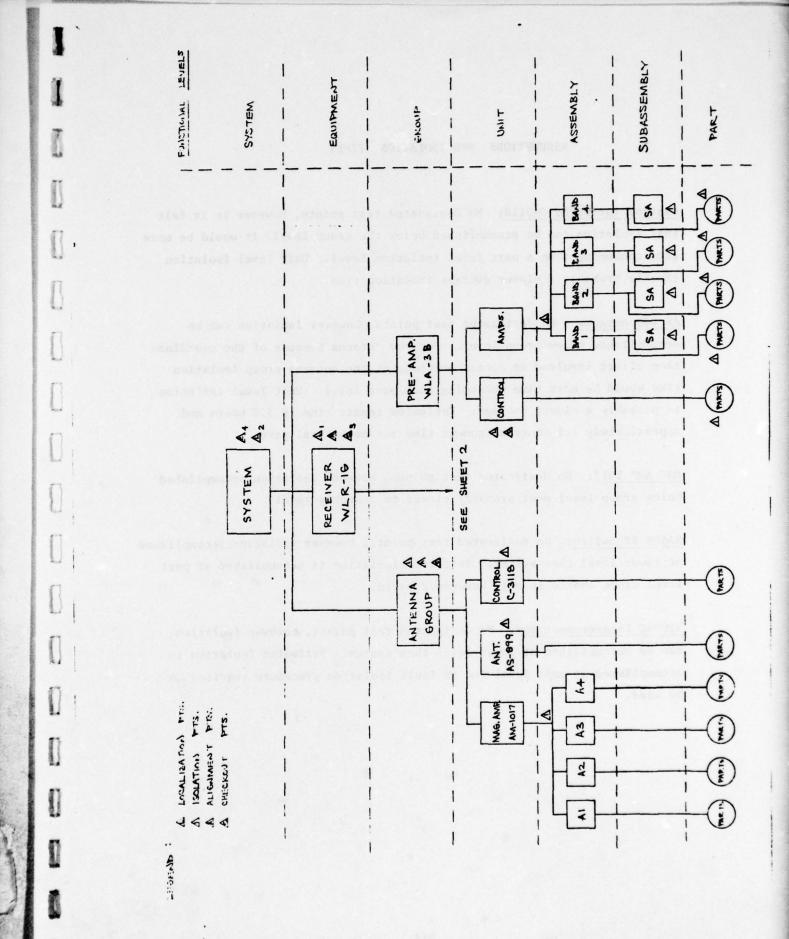
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ASSUMPTIONS FOR ISOLATION TIMES

Control Indicator C-3118: No designated test points, however it is felt that isolation can be accomplished below the group level. It would be more time consuming than a part level isolation level. Unit level isolation time is probably a closer average isolation time.

AS 899 Antenna: No designated test points, however isolation can be accomplished below group level. For the antenna because of the coordination effort involved to access portions of the antenna group isolation time would be more time consuming than part level. Unit level isolation is probably a closer average. Estimated repair time is 5.0 hours and approximately 1.5 hours alignment time for mechanical parts.

MAG AMP 1017: No designated test points, however isolation accomplished below group level most probably closer to assembly level.

SA609 RF Switch: No designated test points, however isolation accomplished at lower level than system. Estimated isolation is accomplished at part level since choice is only between 2 parts.

J1008C Interconnect Box: No designated test points, however isolation can be accomplished at lower level than system. Estimated isolation is accomplished at unit level due to fault isolation procedure required to be used.

ESTIMATED INTERCHANGE TIMES

TIMES PERFORMED INTERCHANGE TIME (HRS.)	distrib.	(7736	Carrio	Carda) 2.5 est.	()	(28 B & D)	•	•		2.5		1.0 hrs. est.		
ELEMENT TIME															
DETAILED STEP	Remove A3 assembly	Remove coupling	Remove cable clamp	Unsolder wires	Remove clutch from pot shaft	Solder wires	Fasten coupling	Fasten cable clamp	Re-install A3 assembly	Remove A3 assembly	Disassemble gear train	Remove gear	Instakk gear	Ressemble gear train	Re-install A3
COMPONENT	CONTROL STORER	MAGNETIC CLUTCH,	PRECISION VARIABLE	RESISTOR						CONTROL STORER	GEAR COUPLING,	bearing			

ESTIMATED INTERCHANGE TIMES (cont.)

INTERCHANGE TIME (HRS) 1.0 total estimated	.116 .0186 .0186 .116 .2692	.0986 .0651 .0986 .0651 .0696	.0696
TIMES PERFORMED	20 2 2 20	17 7 17 7 12 4	12 4
ELEMENT TIME	.0093 .0093 .0058	.0058 .0093 .0093 .0093	.0058 .0093 mble A4
DETAILED STEP	Unsoldered wire Remove screws Install screws Solder wire	Unsolder 17 wires Remove 7 screws Solder wires Install screws Unsolder wires Remove screws	Solder wires Replace screws Remove A4 assembly Disassemble/Re-assemble
COMPONENT RFSWITCH RELAY	RACK CONVERTER	ROTARY SWITCH	CONTROL STORER LAMPS

1.0 hrs. est.

ESTIMATED INTERCHANGE TIMES (cont.)

INTERCHANGE TIME (HRS.)	.25 .10 .20 .35 0.9	.5 .01 .01 .50 1.02) 2.0 hrs. est.
ELEMENT TIME TIMES PERFORMED	.10 estimated total .20 estimated total .35 estimated	.5 estimated .01 estimated total .02 estimated total .50 estimated	
DETAILED STEP	Remove switch Unsolder wires Solder wires Re-install switch	Remove switch Unsolder wires Solder wires Re-install switch	Remove A4 Disassemble A4 Unsolder wires Remove switch Install switch Solder wires Reassemble A4 Re-install A4
COMPONENT	CONTROL STORER ROTARY SWITCH	CONTROL STORER TOGGLE SWITCH	CONTROL STORER

ESTIMATED ACCESS TIMES FOR UNIQUE COMPONENTS

AN/WLA-3B

Mast Mounted

Coordinate s/down of equip.=1-2 hrs.=1.5 hr.

Coordinate turn-on= 1.0 hr.

AMPLIFIER SECTION MAST MOUNTED ACCESS 1 hr.

Access, cut potting, pull amp, = 1 hr.

Easy to isolate, very often run out of TWA's

Check out- minimum

Install pannels & pot connector=1.5 hr.

CONTROL INDICATOR In CIC space (below), everything easy to access

and fault isolate = total 1 hr.

lamps outside.

CONTROL IND. C3118

Micro switch are most difficult to access time 2.0 hrs.

Total time may be 4 hrs.

Pull front pannel & other parts.

RESOLVERS

Long time to isolate x lhr.-3hrs. for loose

conn.

Alignment time= 1.5 to 2.0 hrs.

Front pannel difficult to isolate

XFMR difficult to isolate

MAG AMP

Low knowledge of theory of op.

IAl faults long time to isolate 2-4 hrs.

Access time for back parts blower &

coils take long time=lhr.

Other near parts=.5 hr.

ESTIMATED ACCESS TIME FOR UNIQUE COMPONENTS (cont.)

Alignment time 2 hr. time IARI difficult to set for proper rotation starts at the group level

ESTIMATED ALIGNMENT TIMES

AZIMUTH INDICATOR, IP-480

15min equip. warm-up.

16) Adjust C14

17) Adjust R20

53min.

Time	A. 0-	Microsec sweep
min. 5min.	1)	Connect pulse Gen.
3min.	2)	Adjust intensity, focus, position and sync level.
1	3)	Adjust 0-5 trigger A3R16 for stabble pulse.
3	4)	If required, adjust sync range by adjusting gain, sync range sync level for
		max noise deflection.
1	5)	Adjust A4R11 for base line sweep position
3	6)	Adjust A3R20 for 6 pulses.
3	7)	Adjust A3R16,30 for 6 pulses if required.
6	8)	Adjust A3R38,50 for observation @ begin & end of sweep.
2	9)	Adjust A3R20 for 6th pulse @ leading edge.
3	10)	Adjust R16
3	11)	Adjust R20
3	12)	Adjust R30
5	13)	Repeat Adjusting of R20, 16,30,38,50.
3	14)	Adjust R50
3	15)	Adjust 38

AZIMUTH INDICATOR, IP-480 (cont.)

Time
min.

- B. 5-400 Microsec Sweep
 - 1) Make adjustment A. first
 - 2) Approximately 70% complexity of Adjustment A.

- C. .5 K to 50 K Microsec Sweep
 - 1) Make adjustment A.
- 2) Make adjustment B.
- 20 3) Approximately 50% complexity of Adjustment B.
 - D. Sync Range
- 3 See step 4 Adj A.
 - E. Pan Display
- 30 see adj. A of Swept Oscill, CV742 Adjustments
 - F. Scan display alignment => used only when V2 is replaced
- 60 Approximately same complexity as Adj. A.
 - F.F. Scan Display align, minor adjustment
- 40 approximately 70% complexity adj. F
 - G. DF display alignment
 - 1) Adj. sync range first
 - 2) 11 scan diaplay first
- 25 3) Approximately 40% complexity of F Adj.

FREQUENCY CONVERTER CV742

Equ. 15 min. - Equipment warm-up

160 MHZ IF

Time min.

- 15 1) Connect Sig Gen, Test Coupler, UOM
- 15 2) Adjust Gain control knob for VOM Indication
- 6 3) Adjust L9, 18, 76 for max deflection @ 160 MHZ
- 6 4) Adjust 5, 15, 12 for max deflection @ 148 MHZ
- 6 5) Adjust 3, 2, 19 for max deflection @ 172 MHZ
- 9 6) Repent steps 3, 4, 5 for refinement.
- 10 7) Record & plot on graph paper 10 frequency Vs Amp P. data points
- $\frac{15}{82}$ 8) Re-adjust L9, 18, 26 to obtain flat response if required
- 9) Disconnect equipment

Isolation Amp

- 15 1) Similar to 1 above
- 15 2) Similar to 2 above
- $\frac{5}{35}$ 3) Adjust L2 for lowest dip resurance point

39 MHZ IF - Narrow band

- 15 1) Remove tube
- 15 2) Similar to 1) above
- 15 3) Similar to 2) above
- 5 4) Adjust Tl & T2 for min. reading
- 35 5) Replace tube

Fix Oscill.

- 1) same as 2) above
- 2) same as 2) above
- 3) Adjust L17 for min deflection

Swept Oscill.

A. Align Panoramic Display (unit 12)

	۸.	Align Panoramic Display (unit 12)
Time min.		
<u>m111.</u>		
15	1)	Set switch positions - 5
15	2)	Remove cover on Unit 10 & 11
15	3)	Connect scope to Unit 10
15	4)	Select band with shortest sweep
6	5)	Adjust R3, R7 for proper pan sweep
6	6)	Adjust R13, R7, R37, for centered and intensity sweep
$\frac{3}{45}$	7)	Adjust R22/R18 on either unit 10/11 for pan sweep
	В.	Oscill. Align.
3	1)	Connect Sig. Gen., Test Coupler, VOM
3	2)	Adjust gain
3	3)	Remove tube
3	4)	Adjust L5 for min deflection @ 160 MHZ
3	5)	Adjust R25 for max deflection@ 150 MHZ
3	6)	" " " " 170 "
3	7)	" L13, 14, 15 for max deflection @ 170 MHZ
5	8)	Repeat steps 5, 6, 7, for refinement
3	9)	Adjust R25 for max deflection @ 160 MHZ
3	10)	Adjust R26 " " " " " "
	11)	Replace tube
2	12)	Adjust gain control for pan display
3	13)	" R25 " " "
3	14)	" R33 " " @ 150 MHZ
3	15)	" L5 " " <u>< 150</u> "

Time min.	Swe	ept Osci	11.				
3 -	16)	Adjust	R25	for	pan	display	@ 160 MHZ
3	17)	"	R33	"	"		" 170 "
3	18)		R26	"	"	(a. 86925)	centered
3	19)		R29	"	"	A AW CIRCLE	" left @ 155 MHZ
3	20)	. "	R26,	29	for	pan display	" right < 165 MHZ
3	21)	Tighter	n 4 1	ock	nut	s, disconnec	t equipment
10 65		DISCON	NECT	EQU:	IPME	NT	

2 min. min - Test equipment access time

to

20 min. max.

CONTROL STORER, C-2697

- 1) Tighten & loosen appropriate gear set screws
- 2) Align pot rotation
- '3) Hold pot alignments and mesh gear train at stop
- 1.0 hr.
 - 4) Secure gear set screws
 - 5) Index control knob to proper position
 - 6) Check mechnical interlock adjustment

Magnetic Clutches & Pots

- 1) Remo-e friction busing set screws
- 2) Adjust manual tune control

.5 hr.

- 3) Adjust friction drag by adjusting set screws
- Repeat adjustment until pot shaft responds correctly to associated select P/B.

Tuner Servo Alignment

- 1) Connect Sig. Gen. and Oscilloscope
- 2) Adjust Servo gain by adjusting R32, 44, 46
- 3) " Pos. control by adjusting R34, R44
- .75 hr.4) " R32 & R44 to minimize jitter
 - 5) Repeat to achieve max. gain with min. jitter
 - 6) Connect sig. gen. to Unit 8
 - 7) Adjust Unit 8 input controls
 - 8) Adjust gain pot R32 & R44 to obtain correct signal bloom display on panoramic display

CONTROL STORER, C-2697 (cont.)

Scan Gain Adjustment

- 1) Set G pots to CCW position major align.
- 0.25 hr(mm) 2) Rotate band selector and determine which band has highest noise level major align.
- 0.45 hr (major) 3) Adjust Gain for optimum noise display
 - 4) Adjust scan gain pots to obtain optimum noise display on each band.

CV 1162 ALIGNMENT

PRE-SEL

- 1) Adjust all cam eccentrics to be parallel to plate
- 10 min. 2) Conn. multimeter sig. gen.
 - to 3) Disconn. Antenna
- 15 min. 4) Cal. sign. gen for frequency using wavemeter @ Ant. Input
 - 5) Adjust each eccentric for proper frequency

$\frac{3 \text{ min. } \times 9}{40 \text{ min.}}$

- 6) Conn Sweep Gen to Ant. Input
- 7) Conn. Crystal Det.
- 10 min
- 8) Conn video out to scope
- 15 min. 9) Set cam eccentric to lowest position
 - 10) Set eccentric for symmetric band pass
- 3 min. x 9
 - 5 min Disconn Test equip.
 - 20 min Test Equipment warm up
 - 105 min

PRE-AMP ALIGNMENT

1) Rotate tunning slug fully CCW 2) Connect Radio test set AN/TRM-3 (1 cable) 3) Calibrate to 20 MHZ 10 min. 4) Loosen lock screw on Resonator & adjust to Sync for 240 MHZ marker. 5) Adjust tunning slug for min-amplitude 6) Connect fixed atten., Detector and dummy load (7) Set sig. Gen to 400 MHZ 8) Adjust C1, 1, 10, 16, L7, L10, L20, Ti, T2, T3 for max. amplitude 9) Adjust C17 for center frequency 10) Adjust C16 for peak @ 40 MHZ 30 min. 11) Adjust T3, L20 for peak @ 390 " T2, L20 " " @ 410 " 12) L10 for flat response 13) Trim up all adjustments 5 min. 15) Discount all equipment Equipment warm-up 20 min.

ESTIMATED ALIGNMENT TIMES FOR ANTENNA GROUP COMPONENTS

A. SYNCHRO COUPLING

5min. (1) Set synchro shaft.

5min. (2) Set synchro coupling.

10min. (3) Install synchro and align with datum points.

20min.

B. SYNCHRO ALIGNMENT

5min. (1) Loosen 6 screws on mounting clamp.

2min. (2) Align reflector to bench marks and arrow.

5min. (3) Rotate synchro for 0 movement.

5min. (4) Secure synchro.

17min.

C. AM-1017B/SLR ALIGNMENT

lmin. (1) Set gain pot. on magnetic amplifier CCW.

1min. (2) Set control indicator selector switches.

5min. (3) Energize control indicator and measure voltages at TP2.

3min. (4) Adjust mag. amp. R15 for minimum voltage reading.

3min. (5) Adjust mag. amp, R15 for mimimum voltage reading.

5min. (6) Repeat 4) & 5) for balance reading less than 1.0V.

5min. (7) Adjust mag. amp. pot. R1 for maximum voltage reading.

5min. (8) Adjust Control Ind. error pot for proper antenna rotation overshoot.

5min. (9) Repeat 1-8 if required to achieve proper overshoot.

33min.

ESTIMATED ALIGNMENT TIMES FOR ANTENNA GROUP COMPONENTS (cont.)

D. BELT TENSION ADJUSTMENT

15min. (1) Increase tension for maximum rotation by moving MP1225.

In addition to corrective maintenance, the technician will also perform preventive mantenance (PMS) when such actions are scheduled. A summary of the recomended PMS checks in the technical manual are listed below. Those specified on the maintenance index page (MIP) are shown together with the maintenance time. A summation of the indicated MIP maintenance times over a one year period totals 137.8 hours.

PMS

DAILY WLR - Check power supply voltage using built in meters

- Check oscillator current on all tuners using oscillator inject meter
- Check grass levels on all tuners using IP-480 pan trace
- Check audio output from IP-480
- AM-1017B Measure maximum antenna speed
 - Check antenna response and drift

WEEKLY WLR-1 - Check power supply voltages

- Check C-2697 storage channels
- Check calibration of IP-480 sweeps
- Measure AC input line voltage

MONTHLY WLR-1 - Clean air filters (MIP, 1.0 hr.)

- Test CV-741 and CV-742 coverters (MIP, 3.5 hr.)
- Test tuners for sensitivity and frequency accuracy (MIP, 6.4 hr.)

C-3118 - Test operation

- Check antenna alignment
- AM-1017B Clean filter and inspect
 - Measure input and output signal levels

WLA-3B - Clean and inspect

- Operational check, measure small signal gain for each band

QUARTERLY WLR-1 - Clean and inspect (MIP, 1.5 hr.)

- Check RF-89, FM discriminator

AS-899 - Test Antenna operation

SEMI-ANNUALLY WLR-1 - Lubricate tuners and Control Storer. (MIP, 0.5 hr.)

- Check RF switch insertion losses

AS-899 - Lube and inspect

ANNUALLY AS-899 - VSWR Tests

General Purpose Test Equipment For the WLR-1G

CATEGORY	RECOMMENDED EQUIPMENT
Multimeter	AN/PSM-4
Electronic Multimeter	AN/USM-116
Differential Voltmeter (DC VTVM)	CCUH-825A
Signal Generator	AN/URM-26B
	AN/URM-49A
	AN/URM-62A
	AN/URM-61A
	AN/URM-52A
	CAQI-620A
Sweep Generator	AN/TRM-3
Oscilloscope	AN/USM-140 or
	AN/USM-105A
Test Coupler (Part of MK-442D/ WLR-1) (Unit 30)	30A2
Power Meter	AN/USM-177
Frequency Meter	CAOI-536A
	CAQI-537A
Multimeters	AN/USM-34 ME-6()/U
Oscilloscope	AN/USM-24
Signal Generator	AN/USM-27
Radio Test Set	TS-907/ULR
Pulse Generator	HP-214A
X-Y, Recorder	Moseley HO1-135C
Sweep Generator	Alfred 650
Sweep Generator Tuning Unit Sweep Generator Tuning Unit	Alfred 651 Alfred 652
Sweep Generator Tuning Unit	Alfred 653
Sweep Generator Tuning Unit	Alfred 654
sweep Generator Tuning Unit	Allred 034

APPENDIX D

AVAILABILITY MATH MODELS

Inherent Availability Model

The availability math model used to compute the inherent availability for the AN/WLR-1G is given by,

$$A_{i} = \frac{\mu_{i} + [\lambda_{i} e^{-t(\mu i + \lambda i)}]}{\mu i + \lambda i}$$

$$A_{s} = \frac{\pi}{i = 1} A_{i} \cdot A_{5,6} \quad \text{for N= 1, 2, 3, 4, 7 - 14}$$

where: A_i = Availability of the ith block A_s = System Inherent Availability λ_i = Failures/10⁶ hours for ith block μ_i = 1/MTTR of ith block

t = Time in hours

For the redundant blocks 5, 6

$$\mu_{5,6} = \mu_{5} = \mu_{6} = \frac{1}{5.0 \text{ hours}}$$

and by use of equations 3-3 and 3-4,

$$\int_{0}^{\infty} R_{5,6}(t) dt = \int_{0}^{\infty} [e^{-\lambda_{5}t} + e^{-\lambda_{6}t} - e^{-(\lambda_{5} + \lambda_{6})t}] dt$$
 [3-3]

MTBF_{5,6} =
$$\frac{1}{\lambda_5} + \frac{1}{\lambda_6} - \frac{1}{\lambda_{5+\lambda_6}}$$
 [3-4]

the availability of blocks 5,6 is given by,

$$A_{5,6} = \frac{\mu_{5,6} + [\overline{MTBF}_{5,6}] [e^{-at} + e^{-bt} - e^{-ct}]}{\mu_{5,6} + \frac{1}{MTBF}_{5,6}}$$

where:
$$a = \lambda_5 + \mu_5$$

 $b = \lambda_6 + \mu_6$
 $c = \lambda_5^6 + \lambda_6^6 + \mu_5 + \mu_6$

Operational Availability Model

The availability math model used to compute the operational availability for the AN/WLR-1G is given by,

$$A_{i} = \frac{\mu_{i} + [\lambda_{i} e^{-t(\mu i + \lambda i)}]}{\mu_{i} + \lambda_{i}}$$

$$A_{o} = \begin{array}{c} N \\ \pi \\ i = 1 \end{array}$$

where: $A_i = Availability of ith block$

A = System Operational Availability

 λ_i = Failures/10⁶ hours for ith block

 μ_i = 1/MDT of ith block

t = 8760 hours

Operational Availability was computed only for an 8760 hour period since the logistics delay is derived as an average over 1 year. The values of $\dot{\lambda}^i$ and μ are all taken directly from Tables 3-8, 3-9, 3-10 and 3-11 for the respective modes of operation. No redundancy equations are required for blocks 5 and 6 since the model is for total mode required to be in an up condition.

Inherent Availability Model

The availability math model used to compute the inherent availability for the AN/SLQ-32(V)2 is given by,

$$A_{i} = \frac{\mu_{i} + [\lambda i \quad e^{-t(\mu i + \lambda i)}]}{\mu_{i} + \lambda_{i}}$$

$$A_{s} = \begin{matrix} N \\ \pi \\ i = 1 \end{matrix}$$

where: A, = Availability of the ith block

A_s = System Inherent Availability

 λ_i = Failures/10⁶ hours for ith block

 μ_i = 1/MTTR of ith block

t = Time in hours

For the blocks A, B, C and D, $\lambda_{\mathbf{i}}$ is determined by the equations,

$$\lambda_i = \frac{1}{\int_0^\infty R_i(t)dt}$$
 for $i = A, B, C D$

where:
$$R_{i}(t)$$
 $\sum_{j=k}^{m} {m \choose k} P(t)^{k} [k-P(t)]^{m-k}$

$$P(t) = e$$
k out of m are required

The values for λ and MTTR are taken from Tables 4-9, 10, 11 and 12 for the respective modes of operation.

Operational Availability Model

The availability math model used to compute the operational availability for the SLQ-32(V)2 is given by,

$$A_{i} = \frac{\mu_{i} + [\lambda i \ e^{-t(\mu i + \lambda i)}]}{\mu_{i} + \lambda_{i}}$$

$$A_{o} = \begin{matrix} N \\ \pi \\ i = 1 \end{matrix}$$

where: A_i = Availability of ith block

A = System Operational Availability

 λ_i = Failures/10⁶ hours for ith block

 μ_i = 1/MDT of ith block

t = 8760 hours

Operational Availability was computed only for an 8760 hour period since the logistics delay was assumed to be the same as for the AN/WLR-1G. The values of MTTR and λ are taken directly from Tables 4-, 4-, 4- and 4-. For the blocks A, B, C and D, the value of λ is given by,

$$\lambda_n = (F/10^6 \text{ hours})(\text{total parallel paths})(\text{Qty used})$$

for n = A, B, C, D

The failure rates given in the tables are for one of each parallel path so that, for example, the total failure rate of block A (considering no redundancy) is,

$$\lambda_{A} = (1.183)(38)(4) = 179.8 \text{ f/10}^6 \text{ hours}$$